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THE BRACKEN-FERNS OF NEW ZEALAND.

1. A COMPARATIVE ACCOUNT OF THE SPECIES.

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THE vast majority of the weeds of New Zealand consist of plants which man, intentionally or unintentionally, has brought from other countries, Europe being by far the largest contributor to the list. There are, however, a few indigenous plants, most of them originally occupying comparatively unimportant positions in the vegetation, which, with the spread of settlement, have greatly increased in abundance, and which must now be included among the most aggressive enemies of the farmer. Striking examples of such plants are the various kinds of hutiwai, or piripiri (*Acaena*), and the three ferns which are described in this article.

A good deal has been written about the common fern, which is the species of most economic importance, the outstanding contribution to the subject being A. H. Cockayne's "Conversion of Fernland into Grass" (*Journal*, Vol. xii, p. 421), in which the whole question of the replacement of fern by useful associations is gone into exhaustively. The object of the present article is to give a comparative account of those species of what may be called bracken-ferns, which, by their

power of establishing and maintaining themselves in grassland, must be ranked as weeds. It is intended in a future article to describe the control methods which experience has shown to be most successful in dealing with these weeds, particularly in regard to those species about which little has been written.

There are, broadly speaking, six species of bracken-ferns indigenous in New Zealand, all of which were originally included by botanists in the genus *Pteris*. For various technical reasons certain of them have been removed from the original genus, and the six species now bear the following names :—

Common bracken-fern (*Pteridium esculentum* (Forst. f.) Cockayne).
Hard fern (*Paesia scaberula* (A. Rich.) Kuhn).
Water-fern (*Histiopteris incisa* (Thunb.) J. Sm.).
Scented fern (*Pteris tremula* R. Br.).
Pteris comans Forst. f.
Pteris macilenta A. Rich.

The last three species will not be fully described here ; it will be enough to indicate how they differ from the others, since they can hardly be considered of economic importance. The scented fern is intermediate in appearance between the common fern and the water-fern, but is most like the latter, from which it is readily enough distinguished at sight by the narrower divisions of the frond, and especially by the short tufted rhizome or underground stem, which is quite unlike the long creeping one of the water-fern. The scented fern belongs naturally to the outskirts of the bush, or to such places within it as are well lighted ; it may often be seen now covering large areas in warm sheltered gullies, but it shows little tendency to establish itself on grassland. *Pteris comans* and *Pteris macilenta*, which have no generally accepted common names, but which might appropriately be called "bush bracken-ferns," appear to be more dependent on shade than the other New Zealand brackens, so that their distribution is practically determined by the presence or absence of forest, which renders them negligible as weeds. They agree with scented fern in possessing short tufted (not creeping) rhizomes, so that they are not likely to be confused with the water-fern, which they otherwise slightly resemble. The exclusive possession of widely creeping underground stems (clearly shown in the accompanying drawings) by the three species of economic importance is a significant fact to which reference will be made later.

THE MODE OF REPRODUCTION OF FERNS.

The mode of reproduction of ferns differs widely from that of all flowering-plants, and, apart from its having considerable practical bearing, is interesting enough on its own account to be described briefly here. The fern-plant possesses no sexual organs, but depends for its reproduction on spores, which are one-celled bodies of microscopic size borne in large numbers in sporangia, or spore-cases, which themselves are closely massed in groups called "sori" on the undersurface of the frond. The sori vary greatly in appearance and structure in the different kinds of ferns ; in the three here described they lie near the margin of the frond, and are protected by its recurved edge (see drawings). The spores when ripe are scattered

FIG. 1. COMMON BRACKEN-FERN GROWING WITH TUTU.

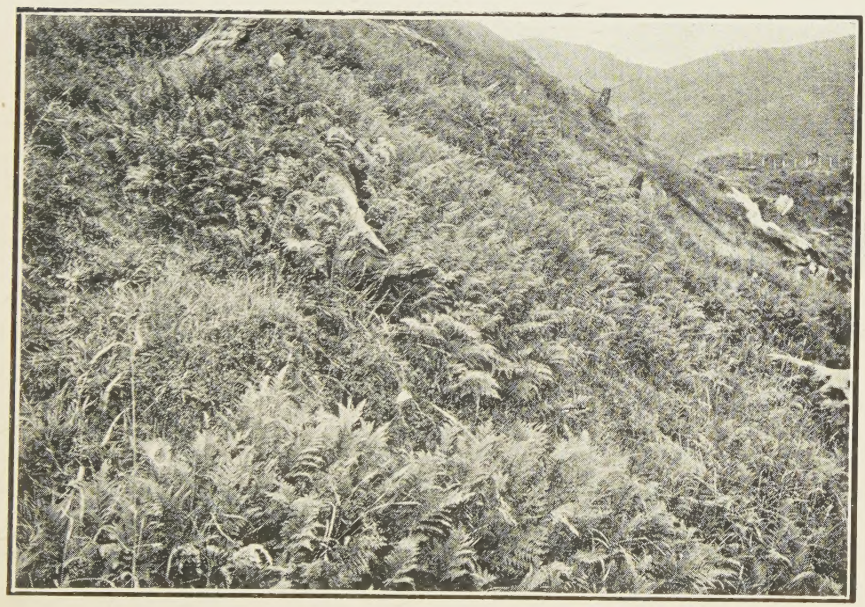

FIG. 2. HARD FERN.

[*Photos by E. Bruce Levy.*

by the wind, fall to the ground, and germinate. Instead of giving rise to a fern-plant like the parent one, each germinating spore produces a very small green, generally flattened, and more or less heart-shaped plant called a "prothallus." On the under-surface of the prothallus are borne the sexual organs. The male cells are capable of independent motion by means of minute waving threads called "cilia." In the presence of moisture—which is an essential—they are able to pass from the receptacle in which they are borne and enter the female organ, where a single one fuses with the female cell, or ovum. From the fertilized ovum there is developed an embryo, which grows into a conspicuous spore-bearing fern-plant like that first described.

FIG. 3. WATER-FERN AT EDGE OF BUSH.

[*Photo by E. Bruce Levy.*

This occurrence of regularly alternating sexual and asexual generations, which is known simply as the "alternation of generations," is a phenomenon not by any means confined to the ferns and their near allies, though it is particularly easy to observe in them. Their production of spores, which can be borne for immense distances by the wind, accounts for the ferns being among the very first plants to colonize an area that has by any means—such as volcanic action—become denuded of vegetation, and for the fact that many species, of which the common fern is a very good example, are almost cosmopolitan in their distribution.

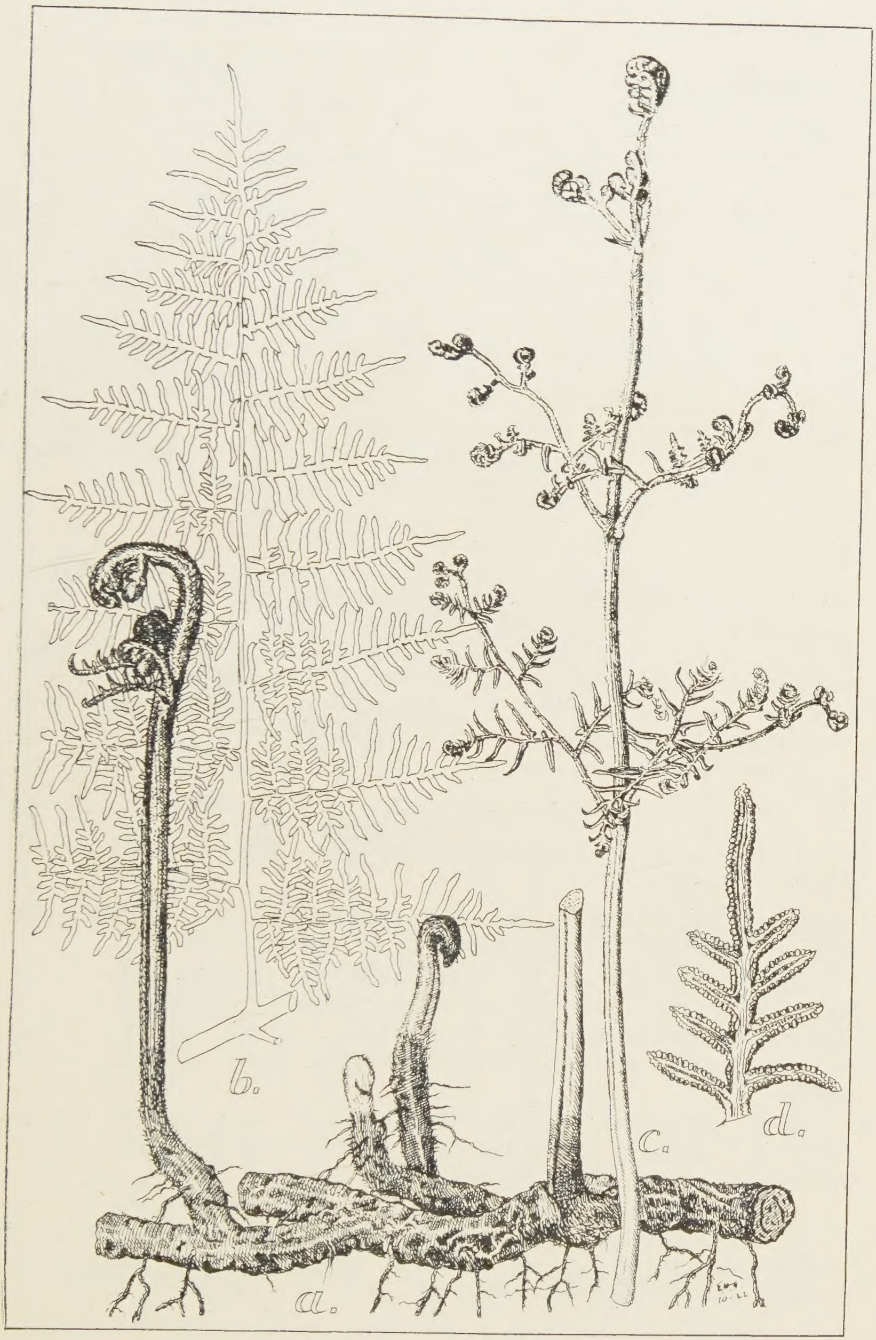

FIG. 4. COMMON BRACKEN-FERN (PTERIDIUM ESCULENTUM).

(*a*) Rhizome, with young fronds in curl stage; (*b*) part of mature frond; (*c*) young frond (later stage than those in (*a*)); (*d*) small part of mature frond seen from below, showing sori. (*a*), (*b*), and (*c*) half natural size; (*d*) enlarged. Original.

Many ferns, including the three described in this article, have a growth-form characterized by a more or less subterranean, horizontally-spreading stem or rhizome, which enables a single plant in a short time to cover a large space. When an area favourable to their development, such as a recent burn, is left open to invasion by the bracken-ferns, such invasion takes place in two stages, distinct enough in reality, though not always easy to recognize: first, the sowing of wind-borne spores more or less evenly over the ground, with the production of prothalli wherever the conditions are suitable*; secondly, the spreading outwards of the fern-plants from these points of infestation by means of their rhizomes. In time these fern-plants will themselves produce spores which may give rise to a fresh crop of prothalli. After the first invasion, however, the prothalli probably play a secondary part in securing the dominance of the ground by the fern, its tremendous vegetative development, which often results in the formation of a network of "fern-roots" below the surface of the soil, completely eclipsing the comparatively slow production of young plants from prothalli.

DESCRIPTION OF THE SPECIES.

The descriptions which follow are arranged in a more or less tabular form in order that the three species may be readily compared, the key which precedes these descriptions being intended to show at a glance the essential differences in general appearance between the three plants. To serve as a basis for comparison the common fern, which might be considered too well known to need description, is included.

Frond (except when young) more or less dry and hard in texture; final divisions narrow:—

Frond brownish or dull green, 2 ft. to 8 ft. or more long, *Pteridium esculentum*.

Frond pale green, 6 in. to 18 in. long, very finely cut, *Paesia scaberula*.

Frond in all stages more or less soft, bluish-green; final divisions broad and blunt, *Histiopteris incisa*.

Common Fern, or Bracken (Pteridium esculentum (*Forst.* f.) *Cockayne*).
Synonym: Pteris aquilina *L. var.* esculenta *Forst.* f.

Rhizome ("fern-root"): Subterranean, few to many inches below the surface; as thick as the finger; widely creeping, branching freely, and producing fronds at frequent intervals; smooth; dark in colour; very mucilaginous when broken; with many thread-like roots.

Stipe (or stalk of frond): Up to many feet in length and as thick as a pencil; at first thickly clothed with golden-brown hairs, afterwards smooth, hard, and shining.

Frond: At first, like the stalk, covered with golden-brown hairs, especially below, afterwards smooth and hard; dull green above, paler below; a few to many feet long; very many times divided, the final segments like the teeth of a comb.

* Hitherto all control methods have been directed against the fern-plant itself. When more is known of the conditions which determine the production of prothalli it should be possible to supplement the present methods with an attack on the fern at an earlier stage in its life-history. This side of the question will be dealt with in a future article.

FIG. 5. HARD FERN (PAESIA SCABERULA).

(*a*) Part of a rhizome bearing a fertile frond; (*b*) part of a rhizome bearing sterile fronds; (*c*) part of a frond seen from below, showing sori. (*a*) and (*b*) half natural size; (*c*) enlarged. Original.

Hard Fern (Paesia scaberula (*A. Rich.*) *Kuhn*). *Synonyms:* Pteris scaberula *A. Rich.; Silver-fern; Pig-fern.*

Rhizome: Near the surface, running over it where the ground is hard; slender, about $\frac{1}{10}$ in. thick; widely creeping, branching, and producing fronds at frequent intervals; covered with reddish-brown hairs, especially in the younger parts; dark in colour; hard and wiry except when young; with many thread-like roots.

Stipe (or stalk of frond): A few inches to a foot or so long, and $\frac{1}{12}$ in. thick; at first pale in colour and hairy, afterwards reddish-brown; hard, wiry, shining, but more or less rough to the touch.

Frond: At first with scattered reddish-brown hairs, afterwards smooth or slightly rough to the touch; rather pale yellowish-green in colour; up to about 18 in. in length; very many times divided, the final segments deeply cut and lace-like, particularly in the case of sterile fronds or sterile parts of the frond.

Water-fern (Histiopteris incisa (*Thunb.*) *J. Sm.*). *Synonyms:* Pteris incisa *Thunb.; Soft Fern.*

Rhizome: Growing nearer the surface than that of the common fern, often nearly on the surface; usually considerably more slender; widely creeping, branching, producing fronds at frequent intervals; irregularly clothed with dark scales or almost smooth; dark in colour; mucilaginous when broken, but not filled with starch like the rhizome of the common fern; roots many and threadlike.

Stipe (or stalk of frond): Up to many feet long; $\frac{1}{3}$ in. thick when young, with scattered scales which soon fall off; at first pale green in colour, with a bluish-white bloom on the surface; afterwards more slender, smooth, hard, and shining, and pale or chestnut brown.

Frond: Smooth at all stages; when young covered with a bluish-white bloom which later disappears; pale blue-green in colour; softer and thinner in texture than the other two species; veins conspicuous when the frond is held up to the light; a few to many feet in length; many times divided, the final segments comparatively broad and blunt.

It has not been thought necessary to describe the sori (or groups of spore-cases), as their arrangement in the different species is shown clearly enough in the drawings, and is difficult to describe in non-technical language. Such other features as are plainly shown in the illustrations are for the most part also omitted from the descriptions.

DISTRIBUTION.

The common fern is found throughout the Southern Hemisphere; in the Northern Hemisphere its place is taken by the closely allied *Pteridium aquilinum* (L.) Kuhn, the English brake or bracken. *Pteridium esculentum* is abundant throughout the New Zealand area, this including, besides the North and South Islands and Stewart Island, all the outlying groups from the Kermadec to the Auckland and Campbell Islands. It ascends in the North Island to about 4,000 ft. The area originally occupied by fern in New Zealand is a matter of speculation. It is an accepted fact that with the destruction of forest the area now covered by it is very much greater than when the country was first colonized, while the Maori traditions of great

FIG. 6. WATER-FERN (HISTIOPTERIS INCISA).

(*a*) Young frond; (*b*) part of a rhizome with younger fronds than (*a*); (*c*) part of a mature frond; (*d*) small part of a mature frond seen from below, showing sori. (*a*), (*b*), and (*c*) half natural size; (*d*) enlarged. Original.

fires point to its having increased largely during their occupation of the land in pre-European days. It enters into almost every type of vegetation up to its altitudinal limit, dense forest being the main exception, though even there it will often appear where openings made by falling trees, &c., have let in the light. In such cases the fronds are softer in texture than usual, and the stalk supporting them is often greatly elongated and almost climbing, a length of 20 ft. being not uncommon.

The hard fern is abundant in many parts of the North and South Islands, Stewart Island, and the Chatham Islands, its altitudinal limit being about 2,500 ft. It is found nowhere else in the world. Hard fern originally occurred chiefly on the outskirts of dry forest, and on slips, banks, &c., especially in clay country, in all of which situations it may still be seen; but it has spread enormously along bush roads and cuttings, and, what is more to the point, has invaded much hilly grassland. In parts of the North Island it is looked upon as a worse weed than ordinary fern.

Water-fern is an abundant plant in suitable localities through the whole of the New Zealand area, while beyond it is found throughout the tropics and the South Temperate Zone. It is more dependent on damp conditions than the other two ferns, and may be seen in tropical luxuriance by the edges of hot springs. But it is not confined to such stations, being found in swamps, the outskirts of bush, and even on fairly dry ridges. Its altitudinal range is from sea-level to 3,000 ft.

(To be continued.)

PERIODS OF OCCURRENCE OF ABORTION IN CATTLE.

THE following tabulated information regarding contagious abortion among cattle in New Zealand, showing the period of pregnancy and the approximate age at which abortion occurred, has been prepared from reports furnished by the Department's Inspectors of Stock, based on twelve months' observation:—

Month of Pregnancy.	Percentage of Cases of Abortion.	Age of Animal affected.	Percentage.
First	Nil.	First calf	21
Second	0·3	Second calf	33
Third	0·9	Third calf	21
Fourth	1·8	Fourth calf	15
Fifth	8·0	Fifth calf	6
Sixth	17·0	Sixth calf	2
Seventh	55·0	Seventh calf ..	2
Eighth	17·0		

—Live-stock Division.

THE CULL COW AND ITS DISPOSAL.

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THE subject of the proper disposal of all cull cows, in such a manner as to prevent their being resold for dairying purposes, has been before the farming community for a considerable time without any definite solution of the problem being arrived at. The fact that it is just as important, and more economical, to prevent the necessity for culling as it is to find means for the disposal of such cows has suggested that it might assist if attention were drawn to the many and various causes contributing to make up this class of unprofitable animals.

Before discussing the disposal of cull cows it is necessary to point out that if legislation is to be enacted for this purpose a definite standard must be fixed as to what constitutes a cull. No progress can be made until this is decided, and it is a matter of some difficulty, for what one breeder who has been culling for years considers a cull cannot generally be accepted as a standard for the beginner, at least for some years to come. The matter of replacement is a serious consideration, as the first man's culls might be considered by the other to be as good as his own best. This position might be met by the formation of an "A" and a "B" grade, leaving "C" to represent culls. With a recognized first and second grade of milking-animals the position would be simplified, but would still leave sufficient dfficulties for serious consideration before a working scheme could be adopted which would promise a fair measure of success.

In considering some of the agencies which tend to bring about unfavourable conditions it must be recognized that the selection of milking strains will not by itself (although it is an important factor) be sufficient without co-operation in other directions, because, while many animals are fated from birth to be unprofitable, a very large number are not. These latter are afterwards made so by sheer bad management at some period or other of their existence, and not on account of any inherited anatomical or physiological disabilities. Therefore, although careful selection for milking propensities may have been made, it is still important that every precaution should be taken to look after the animal's welfare so as to prevent her from becoming unprofitable. This can be done only by educating the stockowner in the most up-to-date methods of stock-management suitable for the requirements of New Zealand conditions. Here is the weakest link in the whole chain of the dairy industry at the present time, and the matter should receive prompt attention if we are ever to attain a general improvement in quantity and quality of milk.

SOME RELATED FACTORS.

Many of the causes operating to make unprofitable cows could be prevented by the stockowners themselves if they would only recognize that proper stock-management is both interesting and profitable, and conducive not only to the health and comfort of the animals but

also to the owners' pleasure and that of every one connected with their establishments. It is recognized that a short article such as the present one cannot contribute much to the farmer's knowledge of stock-management, but if it merely arouses his interest in the subject the object of these notes will have been attained.

The Scrub Bull.

The use of a bull about whose history little or nothing is known is to be at once condemned. True, some use these animals just because they want their cows in calf and have no intention of rearing the calves, but, on the other hand, it is a fact they frequently change their mind as to the selling of some of the cows or the rearing of a few calves for sale; or, seeing a good-looking heifer calf, they may decide to keep her. This is probably a small but it is a contributing factor in the production of unprofitable cows, and I have known instances where such a bull did not confine his activities to his own herd, but devoted a considerable amount of attention to adjoining herds.

Would it not therefore be advisable that some action be taken in the direction of registration of all bulls other than purebred? This would allow owners who desire to keep what they consider a good grade bull to do so; but if upon inspection by competent officers it is decided that any bull other than pedigreed stock is unfit for registration such decision should be followed by compulsory castration or slaughter. This, in my opinion, would be only a reasonable precaution to protect owners who are doing their best to build up a good herd, and would relieve the dread of many stockmen of the scrub bull upsetting their calculations and thereby causing serious delay to the object they have in view.

Rearing of Calves.

The calf should be kept going from the very start. It should always be kept in mind that with every setback a youngster gets its general development is for the time being retarded, and concurrently with this the proper development of the udder in the female is also affected. Even where the animal is being well cared for, special attention should be given to the immature udder. If found not to to be developing as well as desired, hand massage will be found very beneficial in attracting a fuller supply of blood to that organ and extending and enlarging the cellular tissue. Dogging and chasing of calves should be avoided, strict hygienic conditions should be observed in shelter-sheds, and plenty of shelter should be available at all times. The young animal should have clean grass-runs and attention as to body-lice. When there is evidence of coming horns, the "button" should be removed by knife or caustic.

When one remembers the number of times he has observed calves tied up to a log or stake, standing in a filthy puddle and exposed to all conditions of weather, the wonder is that the number of unprofitable cows is not greater. On the other hand, calves are often well done by until weaned, and then as often as not turned out on most unsuitable pasture (often mostly scrub and fern), and there left to fend for themselves until they are required for the second stage of their existence. By this time all the calf-flesh has disappeared, and hard, dry-coated, pot-bellied, emaciated, expressionless youngsters are

put to the bull with never a chance of doing justice to themselves or their fœtal calf. Here is the double chance of first the mother being made an unprofitable cow, and then of her calf being bred to be one.

Attention at Calving-time.

At this period many a promising cow is ruined for life for want of proper attention. Sanitary conditions are not observed, neither is any examination made to see whether or not any internal injury has been received. Where treatment is required and is neglected the milk-yield is at once affected, and such neglect may lead to the animal becoming permanently sterile, as there is a close sympathetic relationship between the womb and the mammary glands. Sufficient attention is not given to nursing the cow over this critical period, and she becomes to all intents and purposes a cull.

In this connection it may be here represented that the time has arrived (if it is not long overdue) when all unqualified men practising as so-called veterinary surgeons should be registered by the Department of Agriculture, if upon examination they are found to possess sufficient knowledge to be able to efficiently assist stockowners. At present it is no uncommon occurrence to find that more harm than good has resulted from their being called in. Some protection to the stockowner is required in this direction, as far too many men are calling themselves veterinary surgeons without having any qualifications whatever, and misleading the farmer into consulting them.

Purchase of Cows.

Everybody pretends to know about horses, and, before purchasing, makes a good examination as to the animal's suitability for the purpose for which it is required, even although the price asked is a small one. With the cow, however, it is different; in many cases not only "new chums" but older hands do not exercise the care in selection necessary to guard against purchase of defective animals. In this they are not wholly to blame, as at many saleyards no facilities exist for examination to be made. Why farmers as a body do not demand some reform in this respect it is difficult to understand. If cows were penned up singly, then practical men at least would have a better opportunity of examining as to defects, especially those pertaining to the udder. The question of a written guarantee should also be considered, embracing freedom from all defects likely to influence the milk-yield—that is, defects known to the seller or which by reasonable care could have been known to him. This would include abortion, vaginal catarrh, and defects of the udder, whether caused by disease or injury. All these have at one time or another been the subject of articles in the *Journal*, and need not be gone into now, but it may be interesting to state that not half of the cases of mammitis (mastitis) reported are of contagious origin. The majority are therefore preventable more easily than is the contagious form. Unsuitable feeding is a frequent cause of mammitis, as also are chills, which could be prevented, or at least not neglected, in the early stages. The milking-machine, although a great blessing generally, has its drawbacks in that it is a powerful agent in the spreading of udder-diseases and a fruitful cause of injury to the udder.

It is needless to point out that all the above-mentioned conditions contribute largely to the number of unprofitable cows. They by no means exhaust the list, but may be sufficient to demonstrate how complex the subject really is, and how difficult it would be to introduce legislation at the present time which would not leave many loopholes available for dishonesty, thereby giving only a false sense of security and tending to make purchasers even more careless in selection than they are now.

It has often been said that something should be done to protect returned-soldier settlers and other inexperienced persons against the purchase of cull cows, and it seems to be the general opinion that lack of experience alone accounts for their purchasing such animals. This is not always the case. My experience of returned soldiers and observations of their qualifications to make good farmers is not that they do not possess the average knowledge essential to success, but rather that they are handicapped for want of sufficient capital with which to buy good cows. Under present circumstances they buy cheap cows, trusting to their luck in that a discarded animal may do much better in a new home or do better this season than last. In this they are sometimes not disappointed, but the risk is decidedly against them. Are we not, therefore, attaching too much importance to the cull cow's disposal, to the neglect of more pressing reforms?

Milk-testing.

Needless to say, milk-testing is the primary step in the eradication of the unprofitable cow. If its economic value is to be judged by the progress made by testing associations and individual owners since its inception in this country, then here is a reform which should be heartily supported by every one interested in the dairy industry. Finding out the unprofitable cow is of more importance than her disposal, because even if she is disposed of to the butcher at a present loss this would be more than compensated by the ultimate gain. But even here sound judgment as to stock-management is required in conjunction with the milk-testing, as every experienced farmer knows that the milk test, both as regards quantity and quality, depends largely upon general conditions. As a cow to do her best must be under the most favourable conditions for doing so, her general health must be good; any neglect in proper feeding is fatal to success. Congenial surroundings are necessary, and the human touch is indispensable. She must be treated as a chum and a profitable partner in the concern, and not just a part of a milking-machine. Good sanitation must be always observed; her disposition, likes, and dislikes must be studied; and, above all, regularity in attendance should never be overlooked.

Calf Clubs.

Another good move is the formation of calf-rearing clubs, which should be encouraged throughout the Dominion in every possible way, even by those interested only in the prevention of cruelty to animals, because here the coming farmer is educated to take a pride in the health, well-being, and comfort of the animal under his or her charge, thus developing a love for animals worthy of all support. If club

committees will guard against any competitor taking an advantage over the others by giving his calf "tit-bits" not mentioned on the feeding-sheet, there is great promise for such clubs being of immense value, but nothing discourages children more quickly than to have reason to believe that they are not having a fair deal.

DISPOSAL OF THE CULL COW.

Although several suggestions have been made as to the best method of disposal, including branding or spaying, none seems to meet with general approval, because the honest farmer who wishes to dispose of an unprofitable animal can readily dispose of her to the butcher, and will do so without any coercion. The action of many others would be doubtful; in fact, they would neither brand nor spay without compulsion. The spaying of cows has a few advocates, but this practice is not likely to come into general favour, and, indeed, has been already discarded by many who have tried it. The operation should never be performed unless the animal is under the influence of an anæsthetic, otherwise it is a cruel operation, and at best it requires skilful manipulation.

Following upon the lines already taken in suggesting a better system of management, I believe that the solution of the cull-cow problem is in the hands of the stock auctioneers. The time is opportune for auctioneers to come to the assistance of their best clients, the stockowners, by throwing their weight into this question and establishing a special line of their business under the management of capable men dealing solely with dairy cattle. These men could make it their business to find out all about the animals and their records. They could then be classed as specially good milkers, good milkers, or culls. If the latter, it would be arranged that the animals be all penned separately from the others so that no mistake could be made. I have no hesitation in saying that such action on the part of auctioneers would be of the greatest assistance to the dairy industry, besides reflecting to their own credit and profit. If we could only secure the co-operation of salesmen, confidence would be placed in them, a great relief to the inexperienced buyer would result, and the cull-cow question would be settled in the most satisfactory manner it is ever likely to be.

Seed-samples for Analysis.—Samples sent to the Department's seed-station for analysis should be of at least 1 oz. of the smaller and 2 oz. of the larger seeds. It is particularly important that the sample should be representative of the line from which it is taken—that is, that the line should be sampled with extreme care. This is a matter requiring special attention, as many, if not all, of the discrepancies arising in the germination of such seeds as Chewings fescue and cocksfoot are due to the sending-in of samples not carefully made. Seed should be taken from the top, bottom, and middle of a sack, and from every sack in the line, then well mixed and the sample put up.

Limewash for Cow-byres.—Mr. A. T. P. Hubbard, Inspector of Stock at Masterton, states that he has found the following very effectual as a limewash for cow-byres: Quicklime, 1 sack; fat, 25 lb.; treacle, 5 lb.; salt, 5 lb. The method of preparation is to slightly wet the lime and add the other materials while it is hot, then thoroughly mix with more water to right consistency. Being weatherproof, the wash is also suitable for painting the exterior of buildings, &c.

THE GRASSLANDS OF NEW ZEALAND.

PRINCIPLES OF PASTURE-ESTABLISHMENT.

(Continued.)

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SEASONS FOR ESTABLISHMENT OF PASTURES.

In farm practice there are three more or less distinct periods or seasons of the year when an attempt is made to establish pasture-plants: (1) With or without a cereal, in the early spring, or in a spring cultivation of winter-sown cereals; (2) together with rape, in November; and (3) with or without a winter cereal, in the autumn. The natural seeding-time is in the autumn—nature herself sowing then. The seeds of those plants which are tender lie dormant until the warmer weather of spring; the more hardy ones germinate and establish in the autumn, but for the most part do not make much growth until the succeeding spring. Man has worked on the plasticity of nature, and from wild stock has produced high-yielding but, in general, tender plants. These must be sown at the most opportune moment on a specially prepared seed-bed.

DETERMINING FACTORS.

The factors that determine at which period or season of the year the pasture will be sown are primarily (1) climate and location; (2) nature of soil, and its condition with regard to drainage or to its weed-seed content; (3) previous crop or rotational system practised; (4) purpose for which the pasture feed is required; (5) species that comprise the mixture sown. A short consideration of each of these points will serve to show somewhat how each of these factors helps to decide the period when the pasture will be sown.

Climate and Location.

Climate and location to a large extent determine spring or autumn sowings for our pastures. Where early winter frosts are severe spring sowings are general. This is due largely to two factors: (1) In a district where the winter is severe a good deal of supplementary winter forage is necessarily grown in order to tide over the long period of little pasture-growth, and the land on which these forages are grown is ready for sowing down again in the spring; (2) the action of frost on newly-laid-down pasture is often very harmful, not so much from the actual frosting of the young grass, but in an actual lifting of the young plants right out of the ground (Fig. 100). Hence, unless pasture-plants are well established before severe frosts arrive the damage by frost-lifting is often very considerable, and so, in order that establishment may be well effected by winter-time, spring sowings are preferable to autumn ones (Fig. 101). The lifting effect of frost is dependent to some extent on the nature of the soil, loose friable soil lifting much more readily than the firmer and more coarsely textured ones. The actual lifting is due to the expansion of the soil-water when this water

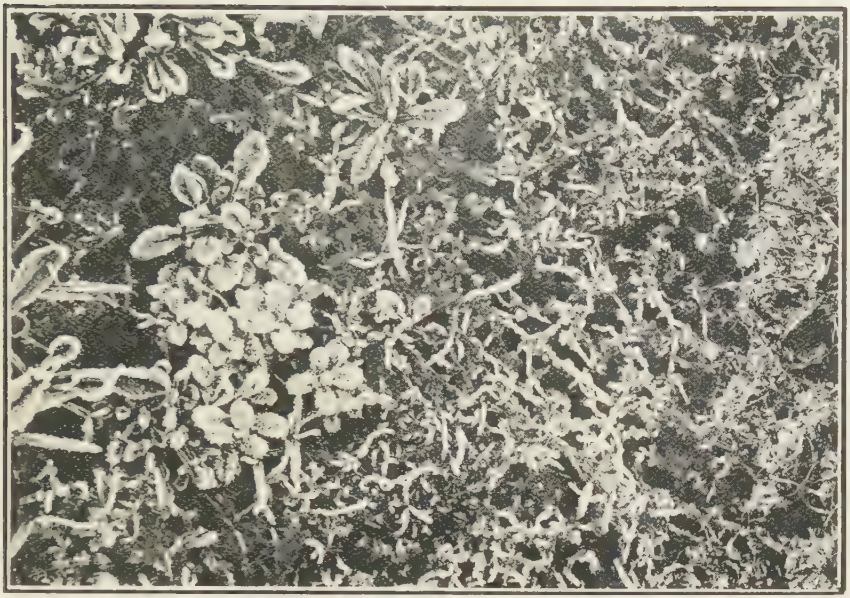

FIG. 100. SHOWING FROST-LIFTED SURFACE IN AN AUTUMN WORKING OF THE LAND IN SOUTHLAND.

Note the honeycombed appearance indicative of frost-lift.

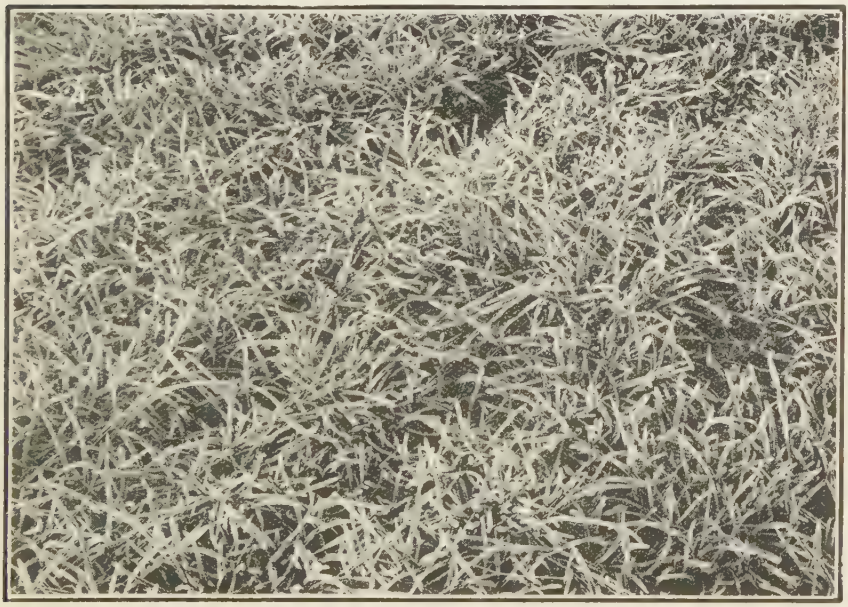

FIG. 101. SPRING-SOWN PASTURE IN SOUTHLAND, WELL ESTABLISHED BEFORE THE WINTER CAME ON.

There is no indication of frost-lift in this sowing.

[*Photos by E. Bruce Levy.*

is frozen into ice, and it is only when the temperature falls low enough to freeze the soil-water that lifting can take place. The season experienced in any one year may modify the general practice of spring sowing in a cold climate. If good summer rains have fallen it is often possible to get in very early autumn sowings, and these may become sufficiently well established to resist the frost-lift. A dry summer, on the other hand, means a late start in the autumn for the pasture, and then it certainly is risky to autumn-sow.

In the South Island spring sowing is general, and for a great part consists in sowing along with a cereal in the early spring or together with rape in November. In these sowings it is obvious that the time of sowing of the pasture is determined very largely by the needs of the temporary cover-crop, the pasture itself being secondary in consideration as far as the establishment of the crop as a whole is concerned. In Southland the oat crop must be in fairly early, else the harvesting is thrown too late in the autumn. Hence also we find that, irrespective of whether early spring sowing for grass is good or bad, the grass is sown at this time. In Canterbury rape is required for summer feed, and for this purpose it is best sown in November. Incidentally the grass gets sown also along with this crop in November. In Canterbury and north Otago also the autumn-sown cereals need cultivating in the early spring, and, again, at this time the grass goes in. In other words, in all these cases the pasture-sowings are made to fit in with the demands of the annual cover, cash, or feeding-off crop. The writer sees no great objection to this where short-rotational-farming practice is in vogue, but just wishes to make the point clear that if the main objective is grassland, then the consideration given to grass-establishment should be primary, and not secondary, as is the case where the cereal for chaff or for grain or some other cover-crop is included.

Particularly does permanent pasture claim every facility and every advantage in establishment that the farmer can give. Here grass-establishment should be the primary consideration, and any additional crop that may be grown along with it should receive secondary consideration only. In Southland and elsewhere there is often a great struggle against spurrey or yarr (Fig. 102), and certainly in these cases it is a great advantage to have the cereal included, owing to its being able to get ahead of that weed; and if the cereal were fed off in the green stage the pasture would be benefited by the reduced content of spurrey. Undoubtedly rape functions well as a cover-crop, being superior to oats for chaff or grain, and this is due almost entirely to the fact that rape is a fed-off crop. The practice of according the pasture-sowing with a temporary annual cover-crop reaches the zenith of indiscriminate application in certain bush-burn country where the felling is fired in summer—January or even December—in order that the turnips sown along with the grass may be assured of success. Here, on land that can practically never be renewed by the plough, the practice of considering the establishment of a purely temporary element like turnips before that of the grass must be absolutely condemned. The primary objective undoubtedly should be grass, and to prejudice the grass "take" in order that the turnips may be a success is almost criminal in an agricultural sense.

FIG. 102. SPURREY OR YARR IN SPRING-SOWN CROPS.

Rapidly establishing and quick-growing plants must be included in the sowing to compete with this weed-growth.

FIG. 103. A WINTER ANNUAL, TOAD-RUSH, IN AN AUTUMN-SOWN WHEAT CROP ON LAND THAT BECOMES WATERLOGGED IN THE WINTER.

On such land spring sowing should be carried out.

[*Photos by E. Bruce Levy.*

Nature of the Soil; Drainage and Weed-seed Content.

On good first-class land there is little to pick and choose between autumn and spring sowings as far as the ability to establish is concerned. This presupposes no early winter frosts, and that the weed-seed content of the soil is not unduly high. On light soils that do not retain moisture well either very early spring sowings or else autumn sowings are necessary. Generally speaking, under such conditions autumn sowings are much to be preferred, and the general principles outlined in dealing with sand-country (see *Journal* for November last, pp. 258–261) apply. Many low-lying and poorly drained soils are often too wet for satisfactorily working to lay down the pasture in the spring, and on these soils autumn sowings are usual. Late spring sowings, however, may be done here, as there is less likelihood of drying-out in the summer than on more elevated situations; and, again, if spring-sown, the pasture will be better able to withstand the renewed wet condition of winter if well established before winter comes on. Further, in these low-lying situations winter annual weeds, such as toad-rush (Fig. 103), are often extremely bad in autumn-sown crops.

On the steep bush-burn country the farmer has no alternative, and he has to sow in the autumn. The general practice is to burn in February or even earlier, and to sow the seed in the ashes of the burn even while these are yet warm Whether or not early autumn burning is imperative in the conversion of forest land to grass the writer at present is not in a position to say. It remains a fact, however, that the succeeding dry months of autumn are extremely difficult ones for the newly sown grass. Fig. 47 of this series in the *Journal* for March last (p. 157) depicts this point fairly well, and there is no doubt that very frequently much of the failure to secure a good sole of grass on bush-burn is due to the fact that often too long a dry spell intervenes between the time of sowing and the rains of autumn. Generally speaking, on a bush-burn moisture is drawn from below to the surface through the heat of the fire, and this moisture is usually sufficient to start germination of the seeds, but the scorching sun soon dries out the surface, leaving the young seedlings to wilt and die.

The weed-seed content of the soil upon which pastures are being laid down is often an important consideration. From estimates made by the writer, by actual counting of all plants that established on small areas in the early stages of the development of pastures, it has been found that good first-class arable lands may contain viable weed-seeds (which actually establish in a sowing) to the enormous number of fifteen million plants per acre, representing a sowing of about 100 lb. of weed-seed per acre. Moreover, such weeds that germinate occur in the first ½ in. or so of soil only, whereas these soils actually contain weed-seeds to a depth of 6 in. or 8 in.—possibly more where the working has been deep. When the weed-seed content is as high as this it becomes a very potent factor in determining whether the sowing shall be in the autumn or in the spring. Most of our weeds of arable land are annuals which establish in the early warm weather of spring. Many such annuals—namely, summer annuals (Fig. 104)—establish only in the spring, and among the more common ones may be mentioned fat-hen, smartweed or red-shank, wireweed, black nightshade, purslane, bindweed, &c. If the pasture mixture be spring-sown

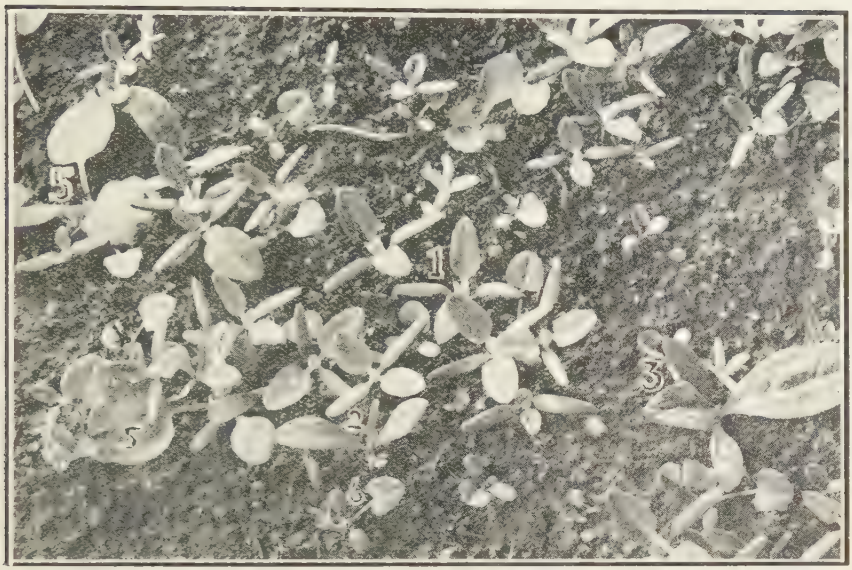

FIG. 104. SUMMER ANNUAL WEEDS (MAINLY FAT-HEN) APPEARING IN A SPRING SOWING OF WHITE CLOVER.

(1) Fat-hen, (2) wireweed, (3) smartweed, (4) sow-thistle, (5) broad-leaved dock, (6) white clover. Where summer annuals are as bad as this in a soil the pasture should be autumn-sown wherever possible.

FIG. 105. FAT-HEN IN A SPRING-SOWN PASTURE BECOMING A STRONG COMPETITOR IN THE PASTURE ASSOCIATION.

If this pasture had been autumn-sown scarcely a fat-hen seed would have germinated.

[*Photos by E. Bruce Levy.*

on land infested with seed of these weeds they become powerful competitors (Fig. 105), whereas if the pasture is autumn-sown there is no danger from them whatever. If these weeds germinate at all in the autumn they never become well-established, vigorous plants.

Fig. 106 is very instructive, and indicates very well how spring or autumn cultivation of certain lands influences the class of growth that may follow. The plot shown was dug over in the autumn, and left so that it might be seen what weeds would occupy the ground. The annual meadow-grass (*Poa annua*) constitutes the main mass of growth, but associated with it are the following weeds: Cut-leaved cranesbill, shepherd's purse, buttercup, and hogscress. This portion of the plot is shown to the left of photo. In the following spring this

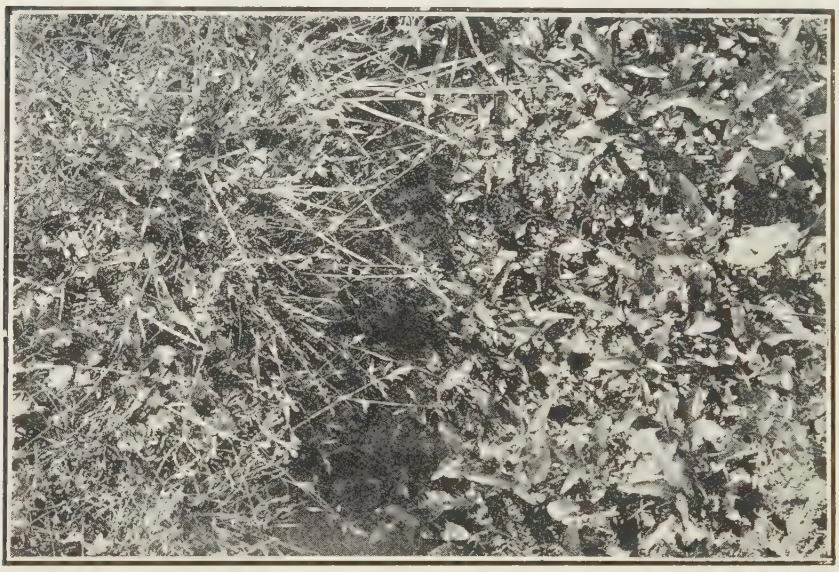

FIG. 106. SHOWING A MARKEDLY DIFFERENT VOLUNTEER GROWTH ON THE SAME SOIL, BUT WHERE CULTIVATION HAS BEEN CARRIED OUT AT DIFFERENT SEASONS OF THE YEAR.

Autumn working on the left and spring working on the right of photo.

[*Photo by E. Bruce Levy.*

plot was in part again dug over, and left to see what natural spring growth would take place. The growth that followed on the newly dug portion was one mass of the summer annual, smartweed. This is shown to the right of the photo. Some Poa annua also established, but this had little chance against the more vigorous weed. From the fact that Poa annua could establish so well in the autumn one may infer that an autumn sowing of grass on this land would have a much better chance to establish successfully than if sown in the spring when the weed competition is so great. Most perennial weeds, such as sorrel, dock, ox-eye daisy, creeping buttercup, field-daisy, &c., germinate readily in the spring, and while they may not become so immediately aggressive as fat-hen, smartweed, &c., yet they are usually able to

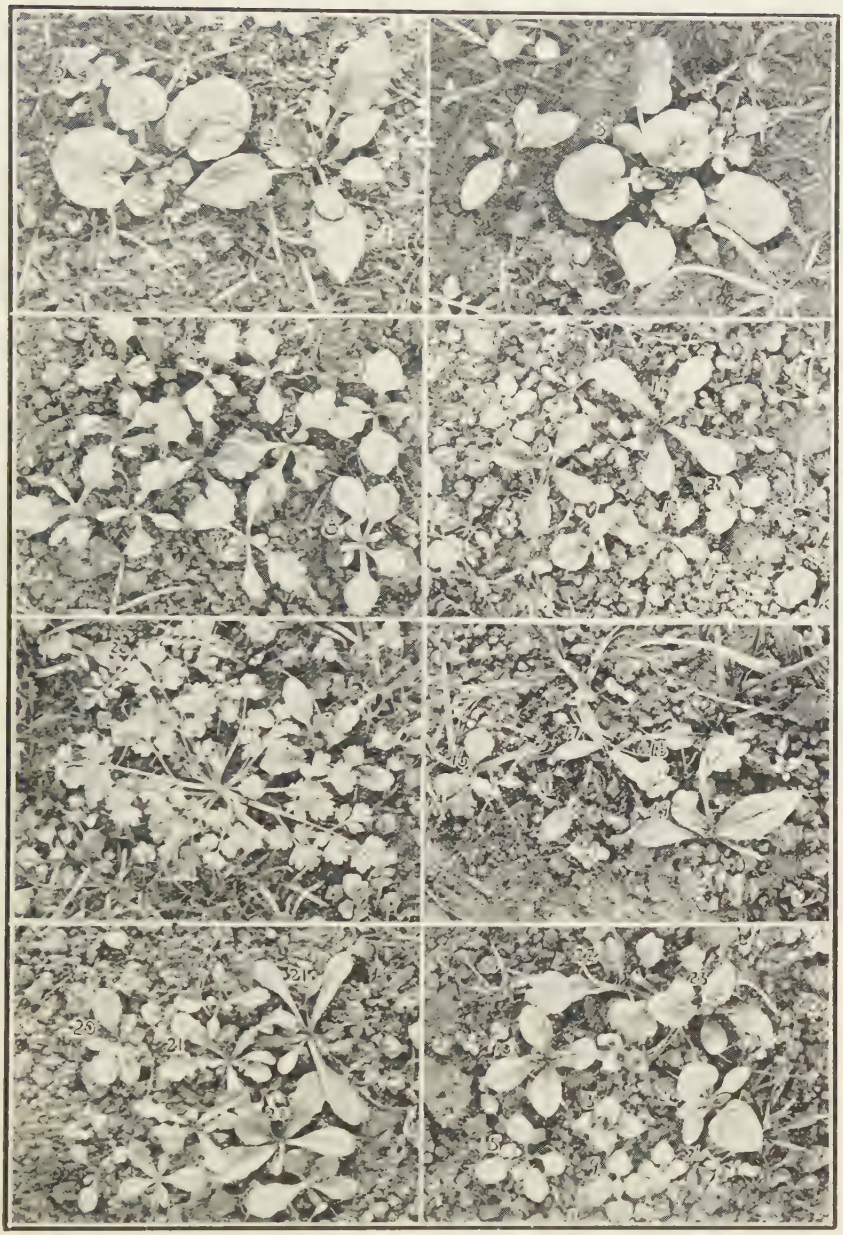

FIG. 107. SHOWING THE CLASS OF WEEDS THAT ESTABLISH AS WELL IN THE AUTUMN AS IN THE SPRING.

(1) Broad-leaved dock, (2) curled-leaved dock, (3) scarlet pimpernel, (4) greater plantain, (5) American cress, (6) groundsel, (7) ox-eye daisy, (8) sorrel, (9) speedwell, (10) mouse-eared chickweed, (11) catchfly, (12) forget-me-not, (13) slender mouse-eared chickweed, (14) fumitory (bad in spring-sown crops), (15) shepherd's purse, (16) sow-thistle, (17) wireweed (usually only in spring), (18) small-flowered buttercup, (19) rib-grass, (20) catsear, (21) dandelion, (22) hairy buttercup, (23) Scotch thistle (more common in spring), (24) black nightshade (most common in spring), (25) annual meadow-grass, (26) hogscress.

[*Photo by E. Bruce Levy.*

persist in a permanent-pasture sowing and to make themselves felt later in the history of the pasture. Perennial weeds such as those mentioned, however, establish well also in the autumn (Fig. 107). This is true also of another set of annual weeds to which belong spurrey, shepherd's purse, fumitory, small-flowered buttercup, American cress, annual meadow-grass, hair-grass, &c. Despite the fact that certain annual and perennial weeds do establish in the autumn, undoubtedly spring is the appointed time for the germination and rapid establishment of most weeds, and particularly annuals.

The next fact to bear in mind in regard to these weeds is that they will not establish in the spring following on an autumn sowing. Once a sward of grass or other cover is effected during that period over which

FIG. 108. SHOWING SCOTCH THISTLE ESTABLISHING ON AN UPTURNED FURROW, THE SEED HAVING LAIN DORMANT IN THE GROUND FOR OVER TEN YEARS.

[*Photo by E. Bruce Levy.*

the annual weeds are dormant there is no likelihood of annual-weed establishment later on, provided the turf of grasses and clovers is maintained. It is really an interesting fact how many seeds seem to have a sort of intuitive power in this respect: they germinate only when establishment is possible, and unless they "feel" the conditions are right for establishment they lie dormant perhaps even for upwards of twenty or more years. Fig. 108 illustrates this point very well. The photo shows an upturned furrow which was run across a permanent pasture during the early spring. The pasture had been down for at least ten years, and there was no sign of Scotch thistle on the area itself. Within a few weeks of the furrow being turned Scotch thistle germinated along that upturned furrow, forming a definite line of

thistle across the paddock. Over one hundred thistle-seeds germinated and established per linear foot of furrow. Many farmers will have met with much the same thing in paddocks that have been heavily stocked during the winter. The turf becomes broken, and light and air—two necessary stimulants to germination—are admitted to the dormant thistle-seeds, which respond by germinating in the spring, and the opened turf cut up by the heavy winter grazing allows establishment of the thistle to take place.

The vegetation to which the ground sown is likely to revert also influences to some extent the question of the season when sowing should take place. It may be set down as a general principle in the control of most perennial weeds, fern, blackberry, &c., that there should be a sufficiency of feed to maintain a heavy stocking at that period of the year when the weed is most vulnerable. In the case of the fern, for instance, this is so when it is just at the curl stage; and in the blackberry when the young tender shoots appear through the ground. Fern-fronds and young fresh blackberry growth appear in the early spring — in October mainly — whereas spring sowings, particularly of permanent pastures, are not rapid enough to produce feed to allow of their being stocked in October, and hence autumn sowings are very much more to be desired. Another advantage of autumn sowings is that most perennial weeds are more or less dormant during the late autumn and winter months, so that the young grass has then no aggressive rival to hinder its establishment. Against autumn sowings on weedy land, however, must be set the fact that competition between the pasture-plants sown and the weeds that come up in the "take" is not nearly so keen as when the sowing is made in the spring, and consequently more weeds (those that are slower) may establish in autumn-sown fields. Thus weeds like ox-eye daisy, field-daisy, hogs-cress, dock, &c., are fairly slow to establish from seed, and these may be readily smothered out in spring-sown pastures, but they are given a better chance to establish in autumn sowings. It will thus be seen that the nature of the weeds whose seeds lie dormant in the soil influences to some extent the time of sowing. Where summer annuals are bad, undoubtedly the sowing, where possible, should be in the autumn.

Previous Crop or Rotational System practised.

Generally speaking, throughout New Zealand there is a demand for supplementary forages, and this is particularly true of the dairy farm, especially in the South Island. These forage crops are usually grown on old pasture lands, and are usually followed after one or two seasons by pasture. The land on which the crops have been grown is available for sowing in the spring, and the usual procedure is to spring-sow pastures on the land occupied by the winter supplementary crop. Hence it follows that the greater the necessity of growing winter supplementary forages in any one district the more regular will be the practice of spring sowing of pastures. This is true virtually of all those districts where really only one crop a year can be grown. In the North Island very frequently two crops can be grown quite well in the one year, and when this is the case it is usual to so work the rotation that the crop preceding the pasture-sowing is off the ground in time to allow of autumn sowing of pastures. Rape, soft turnips, green maize, and special hay crops like oats and

tares for dairy-cow feeding may be cited as such crops. The more general procedure in rotational farming, however, is to study not so much the season most fitted for establishing the pasture, but that season which fits in best with the rotation practised. Here, again, grassland-establishment is relegated to secondary consideration, and it often happens that the previous crop may either be late in maturing or else its utilization is delayed, so that the grass-sowing is hurried in without that essential preparation of the land that is so important to success. In a district where the pasture occupies the land for a considerable portion of the rotation the crops that precede its establishment should be so regulated that while they occupy the land they should be in a sense preparing it for the grassland again. Just how this should be done in the various districts throughout New Zealand is beyond the scope of this article, but the principle involved is one that is well worth considering.

Purpose for which the Pasture-feed is required.

Great as is the value of special supplementary crops, such as roots and green fodders, there is no doubt that much use can be made of the pasture to act as a special winter- and summer-feed producer, and to effect this it is obviously necessary to sow at different periods of the year. In the main the temporary pasture or the short-rotation pasture are the only suitable ones to provide supplementary feed. Good summer feed may be produced by spring sowing of pastures in which perennial and Italian rye-grass are the main species used. This is recognized by many farmers, and the November sowing in combination with rape is primarily a sowing to tide over the summer period. Good winter feed may be produced by autumn sowing of much the same type of pastures, and if a cereal be added to the rye-grass mixture very early winter feed can be produced. The advisability of sowing for such a purpose only quickly establishing grasses like the rye-grasses has been sufficiently stressed earlier in this series (see *Journal* for last May, p. 268, and August, pp. 67–68). The truly permanent pasture should on no account be sown to act as supplementary feed; it should be laid down only in that season and under the best possible conditions for the successful establishment of all its constituents.

Species that comprise the Mixture sown.

Rye-grass may be sown at any season of the year with prospects of success. Even when sown under very dry conditions germination takes place and the plants become established, although the growth will be small until rains fall. With other grasses, however, this is not the case. Cocksfoot, crested dogstail, the Poas, meadow-foxtail, &c., will not germinate under such dry conditions as does rye-grass. In other words, their adaptability of range of conditions is not nearly so wide as in the case of rye-grass. Late autumn sowings of rye-grass are often very successful, but failure after failure of cocksfoot to establish has been recorded owing to too late a sowing in the autumn. Again, late spring sowings of cocksfoot are rarely successful. It must be firmly borne in mind that certain grasses are infinitely slower to establish than others, and whereas a quick-establishing grass like

FIG. 109. SPRING-SOWN PERENNIAL RYE-GRASS "TAKE," SHOWING HOW RYE-GRASS IS CAPABLE OF SUPPRESSING ALMOST ALL WEED-GROWTH THAT MAY GERMINATE IN SUCH A SOWING.

All weeds except an odd dock or so were smothered out.

FIG. 110. SPRING-SOWN COCKSFOOT ON THE SAME SOIL AND UNDER EXACTLY THE SAME CONDITIONS AS THOSE OF FIG. 109.

Note the more open association and the weeds fumitory, fat-hen, curled dock, chickweed, and black nightshade, all well established. Docks were particularly numerous in the "bottom" of the sward.

[*Photos by E. Bruce Levy.*

rye-grass can establish while the conditions may be fairly good, bad conditions may come on before this corresponding stage in the case of the slower-establishing ones is reached. Under the very best conditions for germination rye-grass will germinate and will appear above ground in four days, while cocksfoot and crested dogstail need fully ten days; the Poas need ten to fifteen days, and even as much as twenty-four days before all the seeds sown have even germinated. Clearly, then, under rather adverse conditions rye-grass has the much better chance of establishment, and this has been demonstrated over and over again in pasture-sowings. Thus we may find that of a mixture sown only rye-grass will have established, and this grass, even though it may make little growth until rains fall, is in a position immediately to spring ahead as soon as good growing-conditions return. The permanent species will thus be still further handicapped in their efforts to establish owing to the cover of the rye-grass growth.

Further, as far as weed-seed content of the soil is concerned, little consideration need be given when rye-grass is the main species of the mixture, for this plant by its great vigour and capacity to smother can outdo most annual or biennial weeds that may establish along with it. Figs. 109 and 110 show this point fairly clearly. Both are pure sowings made in the spring. The great increase in the amount of weeds established along with the cocksfoot as compared with that in the rye-grass is very noticeable. The plots are adjoining, and these photographs were taken 3 ft. one from the other.

The choosing of that season best fitted for establishment is really of great importance, for even rye-grass if it gets a check in its early development never assumes the same vigour as does a plant which develops straight away without any check. This is perhaps a reason why a great many farmers prefer spring sowing to autumn sowing. There is no doubt that plants germinating and establishing in the early spring do better than those which germinate in the autumn, and which, after just getting established, are checked by the winter conditions. The rapidity with which certain light soils dry out in the early summer, however, precludes the possibility of good spring establishment of slowly germinating species, whereas the autumn, with its less vigorous competition and usually longer period for establishment, is in general the most suitable for permanent-pasture establishment on these soils. Where there is a long spring and the ground remains moist for a longer period, and where summer annual weeds are not over-plentiful, spring sowings are usually more successful than autumn ones. The question, however, is a big one, with so many influencing factors that no hard-and-fast rule may be laid down.

(To be continued.)

Importation of Plants, &c., from New Zealand into Australia.—Advice was received last month from the Government of the Commonwealth of Australia that owing to the existence of pear-blight or fireblight (*Bacillus amylovorus*) in New Zealand the importation into Australia from the Dominion of all plants and parts of plants (including fruit) is prohibited; provided that agricultural seeds, grass-seeds, vegetable-seeds, flower-seeds, and the seeds of pine-trees and of ornamental shrubs or trees may be imported, subject to the exception of the seeds of any plant of the family Rosaceæ and the seeds of any fruit-tree.

WINTER FEEDING OF DAIRY COWS.

TRIAL WITH SILAGE, ETC., IN SOUTHLAND.

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DURING the months of June and July last a preliminary feeding-trial was conducted at Gore, with a view to obtaining some indication as to the milk-producing value of oat and pea silage when fed to dairy cows, in contrast to the usual Southland winter ration of turnips and straw. The trial was designed to afford an indication of the results which might reasonably be expected from feeding oat and pea silage, and was only intended to act as a guide for future experimental work of a similar nature. It was not intended at first that the results of this test should be published, on account of the facts that complete supervision of the herd was impossible, that no control group of cows was recorded, and that many other important details which should have been rigorously adhered to in a test of this nature had, through force of circumstances, to be neglected. The results, however, despite the admittedly imperfect manner in which they were obtained, are so striking that it is deemed advisable to publish them so that when further trials are conducted comparison with the results already ascertained will be afforded.

For the purpose of the trial Mr. T. Pryde, a dairy-farmer at Gore, kindly placed his herd at the disposal of the Department, and from this herd were selected ten cows which had calved some time prior to the test. These cows were housed in the byre overnight and during inclement weather, so that an excellent opportunity was given to feed the animals with weighed amounts of food. Those selected were a mixed lot of grade cows, giving on an average 17 lb. of milk daily. As practically no grass was available at this particular time of the year the amount of food from this source was so negligible that no account is here taken of it.

PLAN OF THE EXPERIMENT.

As already indicated, the experiment was intended to show to what extent oat and pea silage could replace turnips and straw, and accordingly weighings were made of the amount of turnips and straw consumed daily by the average cow. From this it was ascertained that a cow consumed daily 131 lb. of turnips and 13 lb. of straw. As the trial progressed, the results obtained necessitated a modification of the original plan of feeding, with the result that on completion of the trial five separate rations had been fed to the cows. Each ration was fed for a period of approximately nine days, and the results obtained from the different rations were contrasted and afforded some useful information.

As presenting the relative value of each ration the following tabulation, showing the total amount of dry matter, digestible proteins, and carbohydrates and fat, will be of interest. It will be

observed that particulars as to the deficiency or excess of each of these substances are stated. To obtain these each ration was contrasted with the Wolff-Lehmann standard, which shows the average dairy cow yielding 22 lb. of milk daily to require each day 29 lb. of dry matter, 2·5 lb. of protein, and 14·10 lb. of carbohydrates and fat.

Rations fed during the Trial.

Ration fed.	Dry Matter.	Digestible Protein.	Digestible Carbohydrates and Fat.
	First Period (13th to 21st June).		
	lb.	lb.	lb.
131 lb. turnips	12·87	1·17	8·58
13 lb. oaten straw ..	11·80	0·14	4·54
Total	24·67	1·31	13·12
Deficit ..	4·33	1·19	0·98
	Second Period (22nd to 30th June).		
50 lb. silage	15·60	1·20	7·65
13 lb. oat straw ..	11·80	0·14	4·54
Total	27·40	1·34	12·19
Deficit ..	1·60	1·16	1·91
	Third Period (1st to 9th July).		
13 lb. oat straw	11·80	0·14	4·54
50 lb. silage	15·60	1·20	7·65
20 lb. turnips	1·98	0·18	1·32
Total	29·38	1·52	13·51
Deficit ..	0·38*	0·98	0·59
	Fourth Period (10th to 19th July).		
131 lb. turnips	12·87	1·17	8·58
6 lb. lucerne hay ..	5·19	1·04	1·82
6 lb. red-clover hay ..	5·08	0·42	2·51
Total	23·14	2·63	12·91
Deficit ..	5·86	0·13*	1·19
	Fifth Period (20th to 29th July).		
40 lb. silage	12·48	0·96	6·12
60 lb. turnips	5·94	0·54	3·96
6 lb. lucerne hay ..	5·19	1·04	1·82
6 lb. clover hay ..	5·08	0·42	2·51
Total	28·69	2·96	14·41
Deficit ..	0·31	0·46*	0·31*

* Excess.

From this summary it will be observed that in the case of most of the rations there is a decided deficiency in digestible protein, carbohydrates, and dry matter, which could easily have been corrected by the addition of some concentrate. As the average farmer in Southland does not yet fully appreciate the use of concentrates it was decided not to use any during the trial. Comparing the turnip and straw ration of the first period with the silage and straw ration of the second period, it will be observed that both are quite comparable, having for all practical purposes equivalent weights of dry matter and digestible compounds.

The silage used throughout the trial was made at the Gore Experimental Area from a crop chiefly composed of Webb's oats and Grey Partridge peas. This silage was readily eaten by stock, and was of excellent quality. The following is the result of an analysis made of it: Moisture, 68·8 per cent.; ash, 2·1 per cent.; fibre, 10·4 per cent.; ether extract, 1 per cent.; albumenoids, 2·4 per cent.; carbohydrates, 15·3 per cent.

RESULTS.

A few remarks as to the progress of the experiment will prove of interest, and serve to indicate to what extent the various rations affected the animals.

First period: The ration of turnips and straw used during this period was really a continuance of the ration which the cows had been receiving for the two months prior to the test, and consequently no difficulty of feeding was experienced. The turnips were fed whole, and the straw was not chaffed. Practically no wastage occurred.

Second period: The main object throughout this period was to gradually replace the turnips with silage in such a way that during the last three days of this period the cows would be on a ration of 50 lb. of silage and 11 lb. of oat straw. This was done, but there was such a serious drop in the milk-supply that the trial on silage alone had to be discontinued. A feature to be noted was the fact that where silage was fed the fæces of the cows became dry and hard. This, of course, was to be expected, bearing in mind that the ration was changed from turnips with a high moisture-content to silage with a much lower moisture-content.

Third period: With a view to correcting the dry condition of the fæces 20 lb. of turnips was added to the previous ration, and this rectified matters.

Fourth period: Having noted the results obtained from silage it was decided to eliminate this from the ration, in order to see whether the cows could be brought back to the former production. Turnips, lucerne hay, and red-clover hay were utilized for this purpose, and satisfactory results were obtained.

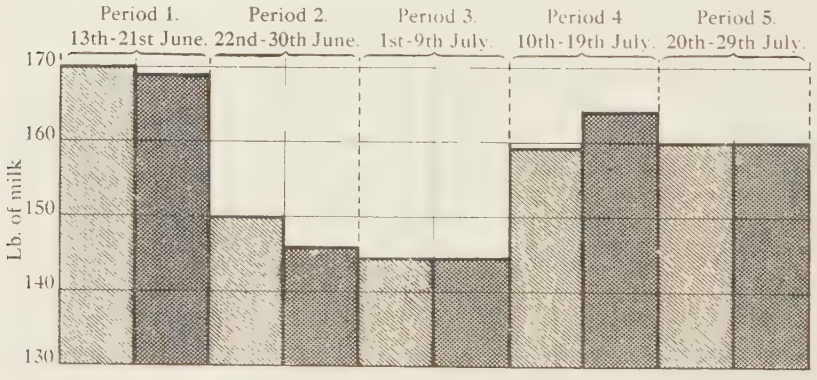
Fifth period: Throughout this period a mixture of turnips, silage, and hay was used, in order to produce a ration which would supply the full amount of necessary digestible compounds. This ration, however, contained an excess of digestible compounds, and a considerable amount was wasted by the animals.

In giving actual figures as to the results of the test it is well to remember that the best indication is obtained from the records of the

last four days in each period, when it might reasonably be expected that the animals had responded to the ration being fed to them. The following table of results, then, gives the total amount of milk produced by the cows during each period, the average daily yield during each period, and the average daily yield during the last four days in each period :—

Period.	Total Yield.	Daily Average Yield.	Average Daily Yield of Last Four Days.
	lb.	lb.	lb.
First (9 days) ..	1,536	170	169
Second ,, ..	1,354	150	146
Third ,, ..	1,309	145	145
Fourth (10 days) ..	1,594	159	164
Fifth ,, ..	1,605	160	160

The figures are diagrammatically expressed in graph 1, which gives a clear indication of the respective yields obtained from each ration. Graph 2 shows the daily yield of the ten cows under test for each of the periods. From this it will be realized how serious was the drop in milk-supply during the second period, when turnips were gradually being replaced by silage, and that the lowest-producing days were from 28th to 30th June, those days on which the cows received a ration of 50 lb. of silage and 11 lb. of oaten straw alone.

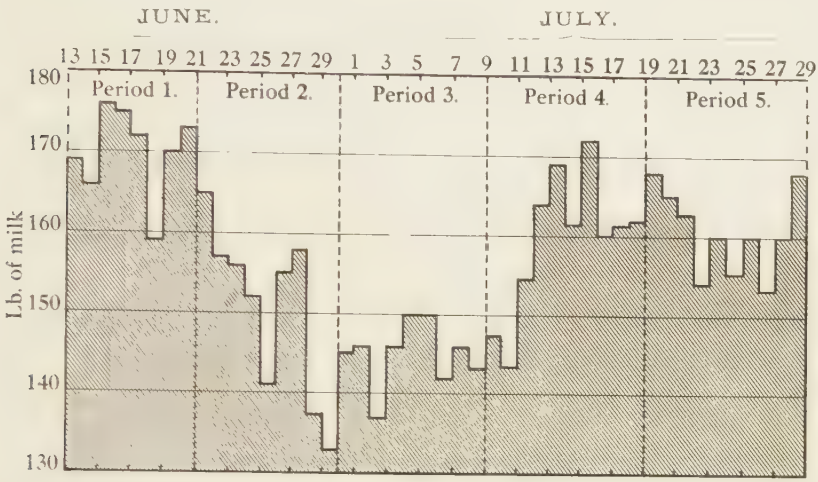


GRAPH 1.

Showing average daily yield of milk (in pounds) from herd for each period, and average for last four days in each period of the feeding-test. Light shading indicates average daily yield for whole period; dark shading shows yield for last four days of period.

That the milk-supply could be kept up to its previous standard was demonstrated by the ration fed during the fourth period, and this ration is a most satisfactory one from a feeding point of view. When contrasting the results obtained from this ration with the orginal ration of turnips and straw, it must be borne in mind that there is a difference of over three weeks in the lactation period.

It is further to be noted that at the commencement of the trial the cows were in a fairly poor condition, and not so well furnished as one could have desired. On conclusion of the test the cows had improved considerably in condition, clearly indicating that quite a percentage of the rations then fed was being utilized for flesh-formation rather than for the production of milk.



GRAPH 2.

Showing daily yield of milk (in pounds) from herd during the different periods of the test.

On the whole, therefore, as a result of this preliminary experiment, oat and pea silage does not compare very favourably with turnips for milk-production. On a comparative basis 2 lb. of turnips are equal to approximately 1 lb. of silage, and on the ground of economy it is dubious if the growing of silage can ever replace the growing of turnips for dairy cows in Southland.

The action of Mr. Pryde in placing his herd at the disposal of the Department for the test is cordially acknowledged, for it is realized that without his assistance and co-operation the results recorded here would not have been possible.

Honey-grading Store, Auckland. — The New Zealand Co-operative Honey-producers' Association's store at Stanley Street, Auckland, has been appointed a grading-store for honey, in place of the New Zealand Express Company's store at Beach Road.

Marlborough Stock-branding Registration District. — The boundaries of this district have been amended by Order in Council gazetted on the 21st December, 1922, and now stand as follows: All that area comprising the counties of Sounds, Marlborough, and Awatere as at present constituted, and including all boroughs and town districts in or adjacent to that area, together with D'Urville, Arapawa, and the other adjacent islands.

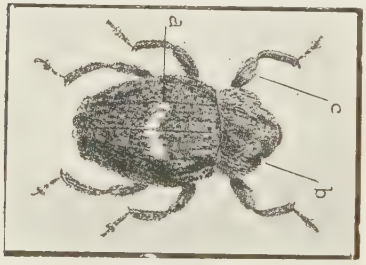
THE FIJI LEMON-WEEVIL (ELYTROTEINUS SUBTRUNCATUS FRM.).

OCCURRENCE IN SOME RECENT IMPORTATIONS.

DAVID MILLER, Entomologist, Wellington.

Two consignments of lemons landed at Lyttelton in June last from the Cook Islands were found by Mr. W. K. Dallas, Orchard Instructor at Christchurch, to be infested by the larvæ of some weevil. Specimens of the infested lemons were forwarded to the Department's Biological Laboratory for determination, and the larvæ were successfully reared to the adult. Specimens were sent to Dr. G. A. K. Marshall, Director of the Imperial Bureau of Entomology, London, who identified them as *Elytroteinus subtruncatus* Frm.

This weevil was first recorded from Fiji in 1881, and recently was found at Honolulu infesting the roots of the white ginger-plant (*Hedychium coronarium*), the authorities, in consequence, prohibiting the transportation of this plant throughout the Hawaiian Territory. The weevil has not been recorded heretofore upon lemons.



FIJI LEMON-WEEVIL.

Fig. 1. Adult, × 3½ (after Marshall). Fig. 2. Larva, × 3.

The adult weevil (Fig. 1) measures about ¼ in. long; the general colour is chestnut-brown owing to the chestnut-brown vestiture, although only the ground-colour of the thorax is of this colour, that of the wing-cases being black, seen along the numerous lines or striæ which are destitute of vestiture. There are patches of snow-white vestiture on the upper surface of the body, and these are more distinct about the middle of the wing-cases, where they form a more or less distinct, transverse, slightly curved band (*a*). The posterior end of the wing-cases, which come well down over the sides of and curve slightly beneath the abdomen, is truncated, while the side margins of the thorax are notched just behind the head (*b*), the latter being practically concealed from above. On the under-side of the front femora is a distinct tooth (*c*). The snout or rostrum when at rest lies in a groove, which extends to between the articulation of the first pair of legs.

The larvæ (Fig. 2) are legless, of a creamy-white colour, with a distinct brown head, and measure about ½ in. long when full grown. They are rather plump, the head end of the body being narrower, and they rest usually with the body more or less doubled.

Observations made at the Laboratory and by Mr. Dallas showed that the fruit was attacked at the base of the stalk, the larva working its way through the peel and tissue lying immediately thereunder; the core was also found to be attacked. As far as was observed there was never more than a single larva in one fruit, and as the point of entrance was not discernible it is probable that the female punctured the base of the stalk and laid her egg therein. Pupation took place in the fruit, and if the latter decayed before the adult developed, its emergence was greatly hindered or even prevented.

COLLAR-ROT IN PEA CROPS ON THE WAIRAU PLAIN.

SOME CAUSES AND PREVENTIVE MEASURES.

F. W. GREENWOOD, B.A., Instructor in Agriculture, Wellington.

CONSIDERABLE concern has been caused this season among farmers on the Wairau Plain, Marlborough, because of the failure of many of the pea crops, consequent upon the ravages of the Fusarium fungus disease commonly known as collar-rot. This disease begins by causing the stem to rot just above the crown. As it spreads it reaches the root, soon causing the latter to become a putrid mass. It also extends vertically up the stem, causing the leaves to wilt and the plant finally to die. Infection is conveyed through the medium of the seed and straw, but rarely through the soil. Early in November last I inspected a large number of crops in various parts of the Blenheim district, and found fully 90 per cent. of them to be infected with this disease. The chief varieties inspected were Dwarf, Medium Straw, and Partridge. Of these the Dwarf variety seemed to be suffering most seriously, while Medium Straw seemed to withstand the attacks of the disease better than did Partridge crops.

Probably Marlborough pea crops have been more or less affected with this disease for years, but it has become more pronounced than usual this season. Some of the reasons for its additional severity this year are fairly obvious:—

1. The warm humid weather which was experienced in the spring has favoured the growth of the fungus-spores.

2. In the Spring Creek district, where the disease is most pronounced, the worst failures are on badly drained and sour soils.

3. The practice of manuring a soil year after year with superphosphate alone has been prevalent among some of the farmers. This has had the effect of gradually exhausting the lime content of the soil. Through sour-soil conditions the plant has been so weakened as to be less able to withstand the attacks of the disease.

4. Soil-samples which were taken from the Dillon Point Road district two years ago showed on analysis that the lime content of many of the river-silt soils was running out. This is, of course, due to the farmer's cropping year after year, regardless of the relentless operation of the law of diminishing returns. Samples which were analysed this season from the Spring Creek district showed that a similar process was taking place. Some soils on the Wairau Plain are so plentifully supplied with lime as to have a negative lime requirement. On the other hand, the requirements of Spring Creek soils vary from 14 cwt. to 30 cwt. per acre. It is evident, however, that a deficiency of lime to the extent of 1 ton per acre would not alone be

PEA CROP (ON LEFT) AT SPRING CREEK THAT HAS SUCCUMBED TO COLLAR-ROT, ADJOINING HEALTHY CROP OF TARES.

[*Photo by J. M. Smith.*

responsible for the destruction of a pea crop by collar-rot. On Mr. F. W. Soper's property, at Spring Creek, the lime requirement of a paddock where a good crop of peas has been grown is exactly the same as another on which the pea crop has succumbed to the attacks of the fungus. One thing is particularly noticeable, and that is that the most glaring failures are produced upon the sourest soils. No doubt infection from the worst crops has rapidly spread, so that now peas are suffering from the disease in many cases irrespectively of the soils upon which they are grown.

5. Very sandy soils markedly deficient in humus, and hence poorly supplied with nitrogen, have usually suffered badly.

6. In cases where no attention has been given to proper rotation of crops the results have most frequently been disastrous. In one case the growing of peas after peas next to a crop where a proper rotation has been employed is most striking; in the former case the

crop hardly exists, while in the latter it is fairly good. Obviously, the remedy which most readily suggests itself is to employ a suitable rotation—say, wheat, oats, or barley, followed by temporary pasture, which might in turn be succeeded by a root crop before legumes are again grown. Tares, however, do not seem to be subject to the disease in question. At Mr. A. Gane's property, Spring Creek, a fine crop of tares has been produced in the same paddock as a crop of peas that has taken the disease badly. A careful inspection of the tare crop revealed no signs of disease. This season in the Blenheim district peas are being grown on contract at 5s. to 5s. 6d. per bushel, and tares at 8s. 6d. per bushel. As there is a good and fairly constant demand for tares, it should pay the Marlborough farmer to turn his attention in the future more than he has done in the past to the production of tare-seed.

THE APPLICATION OF LIME.

In a comparatively dry district such as that under consideration the advantages of a quick-acting manure like superphosphate are indisputable. There is every reason to believe, however, that the use of super after lime should yield equally good results. There are various rich lime-deposits in Marlborough. The most accessible, although not the richest, is that at Flaxbourne. This deposit is two miles from the Ward Railway-station, the road to the railway being quite good, and offering no obstacles to the easy transport of lime. The deposit, which is on Mr. A. Thompson's property, has now been worked for several years, the soft portion of the deposit being simply screened and supplied to the farmers at a moderate rate. The position now is that only some 300 tons more of the soft lime remain. After this is exhausted the hard limestone, which appears to be of a higher grade, will have to be crushed. Mr. Thompson, I understand, is willing to install a crushing plant, provided he can obtain orders for 1,000 tons for the first twelve months. No more reasonable proposition could be placed before the Marlborough farmers, and it behoves them to look to their own interests and to the future development of their richly endowed province.

It is certain that the present trouble with the pea crops, also the falling-off of certain of the lucerne crops, would have been greatly mitigated if lime had been applied where it was so obviously necessary.

PEAR-MIDGE PARASITE.

In order to secure, if possible, consignments of the pear-midge parasite for liberation in the midge-infested areas of New Zealand, the High Commissioner in London, at the request of the Department of Agriculture, communicated with the Director of the Imperial Bureau of Entomology. The outcome is that the honorary managing committee of the Bureau has voted the sum of £200 for the investigation of the parasite. This work is being carried out at the Rothamsted Experiment Station, Harpenden, Herts, and as soon as material is available arrangements will be made for a shipment of the parasites. The work of establishing the parasite in this country will be carried out by the Department of Agriculture.

COW-TESTING ASSOCIATION NOTES.

W. M. SINGLETON, Director of the Dairy Division, Wellington.

THE testing of ordinary herd cows under the association system continues to increase in New Zealand from season to season. Dairy-farmers are appreciating to a greater extent the importance of this branch of work, and never before has cow-testing received such strong support independent of the assistance of the Department of Agriculture. Even yet, however, the percentage of the Dominion's dairy cows whose records are being authenticated is far below a desirable proportion.

INTERIM STATISTICS REGARDING SCOPE.

It is still too early to give definite figures of all cows under test this season, data from privately conducted associations being still incomplete. The following particulars, however, will be of interest to *Journal* readers:—

For the season 1921–22 officers of the Dairy Division controlled some 50 associations, representing 23,326 cows owned by 1,053 members. This year the Division is conducting 55 associations, comprising 25,737 cows and 1,163 members, an increase of 5 associations, 110 herds, and 2,411 cows.

To date we have received figures for some 14 associations which have been newly formed this season. Of these, 10 are controlled by officers of the Dairy Division, and a total of 166 herds and 4,214 cows are represented.

So far figures for some 68 associations, including 1,478 herds and 32,875 cows, have been received at this office, and it is anticipated that complete figures will show a considerable increase over the number of cows previously tested.

EXAMPLES OF DEVELOPMENT.

Some noteworthy increases in association membership have come under notice. The Kia-ora Association, for instance, had 12 members for the season 1920–21, 22 members for 1921–22, and 56 are testing this year. Hokianga increased from 22 members last season to 57 this season, Kaipara from 22 to 56, and North Canterbury from 32 to 43.

An outstanding example of development is that of the Kaitieke Association. In September, 1920, the Kaitieke Co-operative Dairy Company took over the services of Mr. W. G. Batt, one of the Department's Dairy Instructors, and, apart from his work as Farm Dairy Instructor, he energetically took up the matter of forming a cow-testing association. The annual summary for Mr. Batt's first year included 47 members; the second year it rose to 77; and this year there are, up to the time of writing, no less than 126 members, with 2,580 cows. The company has very wisely allowed every facility for the extension of the cow-testing association connected with it, realizing that higher production means more raw material, and therefore reduces manufacturing-costs.

(To be continued.)

VINE-CULTURE UNDER GLASS.

(Continued.)

W. H. TAYLOR, Horticulturist, Wellington.

The Second Swelling and Colouring.

THINNING the berries is, as far as possible, completed in one operation. This, however, is only accomplished by those who are experienced in the work and who know what the vines they are working on are capable of doing, as well as the size of berry to expect on different varieties. At least twice as many berries must be removed from Gros Colman as from Black Hamburgh. Inexperienced people usually underthin, with the result that the berries soon crush together, rendering a second thinning necessary. In a ripe bunch the berries should touch each other without crushing. A bunch when cut and placed on a dish should retain its shape. The exercise of judgment, backed by experience, is necessary to secure this condition. If the berries crowd together, and the bunches have a stiff unyielding appearance when the second swelling begins, more berries should be taken out or the bunches will be spoiled. The thinning should be completed before stoning is complete, but is better done late than not at all.

Soon after the second swelling begins the skin of the berries assumes a different appearance: it looks more transparent, a sign that ripening has commenced. The greatest increase in size is made during this period, swelling continuing until colouring is nearly finished. On this account the border should not be allowed to become dry. Watering, when necessary, may be freely done until the berries are half-coloured. By the time stoning is complete and the second swelling commences the condition of the whole vine will have changed: the laterals will have become woody and the leaves firm. If the conditions in the house are as they should be there will be no further danger from mildew. The state of a vinery should be naturally dry. Atmospheric moisture can then be increased when desirable, and during rainy weather there will not be too much dampness. During fine weather what is termed a buoyant atmosphere should be maintained—that is, the air should not be dry. Damping down may be necessary, but this is a matter for the exercise of judgment; some houses do not require it. Syringing the vines at this period is useful in keeping down red spider. Syringing does not injure the bloom on the berries, though it is commonly said to do so; it may be continued till colouring is well advanced.

During the ripening-period great care should be taken not to interfere with the respiratory system of the vines. If at this time any great amount of foliage is removed it causes a check in the development of the fruit. This emphasizes the necessity for timely attention to stopping or checking surplus growth before it has developed to a wasteful extent, so as to foster the main leaves, which are of the greatest importance, and secure a free passage for air.

A good canopy of foliage above the fruit is required, but not in a crowded condition. If, through neglect, there is at this time more lateral growth than there should be, such growth should be left till the grapes are ripe before cutting it out. In the meantime pinch off the points to prevent them advancing farther.

The After-ripening Period.

This is an anxious time to many growers of Gros Colman, the berries of this variety often cracking badly; it is not an uncommon experience to lose the greater part of the crop from this cause. Madresfield Court, a muscat variety, is subject to the same trouble. This variety, however, is not extensively grown in New Zealand. It is not necessary to here enter into details concerning the common opinion as to the cause of the cracking, as the theory supporting it has been proved to be wrong. The real cause is that the skin of the berry of these two varieties is peculiar and different from that of others, being very porous and able to absorb a considerable amount of water. Thus when the atmosphere of the house is surcharged with moisture, as may occur during wet weather, the berries absorb water, but, as the skin is not able to stretch any more, ruptures are caused. The remedy is to prevent, by judicious ventilation, anything like a still atmosphere about the berries. Some amount of top ventilation should always be on, by night as well as by day. A still further reason for a proper control of lateral growths is here provided, for if the foliage is crowded the difficulty of keeping the air moving will be greatly increased.

These conditions of ventilation are also suitable for keeping grapes of other varieties after they are ripe. Absolutely dry conditions should be avoided or the berries will not remain plump. In a very dry house a little damping down is advisable. In this matter, however, treatment right in one place would be wrong in another: every house should be treated in accordance with its condition.

Regarding late lateral growth, some growers think this should be allowed to run free. In my opinion such a course is wrong, as it tends to keep the vines active too long. This growth should be checked as before, and the vines encouraged to go to rest, because the resting-period is very short in this country whatever may be done.

Manuring established Vines.

The manurial requirements of grape-vines are practically the same as those of most fruit-trees, but as the vines are planted close together, resulting in the soil being heavily taxed, manuring must be on a much more liberal scale than in the case of orchard trees. The principal elements necessary are phosphates, potash, nitrogen, and lime, just the same as are required for most other fruits and general crops. In the case of grape-vines, where liberal quantities are used, it is necessary to be careful that some of the elements in the case of both artificial and organic manures are not used in excess. A proper balance is necessary to secure the best results and to avoid danger.

Lime is of great importance; it corrects acidity, liberates potash, increases the activity of nitrogen bacteria, and is required as plant-food. Cases of bad setting and of stoneless berries have been traced to

a lack of lime. Potash is also of great importance. The most useful artificial potassic fertilizer for vines is sulphate of potash. Animal-manures contain some amount of potash, and wood-ashes a good deal, though the amount is variable. The chief artificial phosphates are bonedust and superphosphate; the former is generally preferred for vines. The principal nitrogenous fertilizers are nitrate of soda and sulphate of ammonia, the former for quick effect, the latter for more gradual use throughout the growing season.

Stable manure is considered a complete fertilizer. It is rather weak in potash, and may contain only a small amount of nitrogen. It is a mistake to apply heavy quantities to the borders; this results in souring the soil, and cases are known where vines have been killed by it. Used in a moderate way, and with a sufficiency of lime, good crops can and have been grown with no other fertilizer. Better results can usually be secured, however, by supplementing stable manure with artificials. Cow-manure has been used with good results where the soil is light and warm. It should be used with caution on borders with heavy soil, as it is liable to seal up the soil and make it sticky.

The growth of vines in different soils and circumstances varies greatly in character. Where growth is very strong much nitrogen in the fertilizer will not be wanted. On the other hand, if growth is weak, or comparatively so, an extra amount of nitrogen, preferably in the form of nitrate of soda, should be given. The role of nitrogen is to promote vegetative growth; it does this only when a sufficiency of the other elements is present.

Following is an outline of the practice of manuring suitable for general use: After the vines have been pruned the border should be cleaned up. If a summer mulch has been applied any strawy debris should be removed. If weeds are present, clear them off. The surface of the border should not be dug, using the term in its ordinary sense, but it may be lightly pointed over with a fork. If the soil is destitute of lime give 2 lb. of air-slaked quicklime per square yard, mixing it well with the surface soil. If lime has been applied not more than two years before, ½ lb. per square yard will be sufficient, while if given regularly every year 4 oz. per yard will be enough. A month or three weeks before the vines start new growth a fertilizer consisting of bonedust 2 oz., sulphate of potash 1 oz., and sulphate of ammonia 1 oz., each per square yard, should be applied, and scratched in with a sharp-toothed rake. Just before the vines begin to flower apply nitrate of soda, 1 oz. per square yard.

Prior to the setting of the berries the surface of the border should be open to the sun. On the other hand, if some protection against sun and wind is not provided during summer the surface soil becomes dried up and the roots go down deep in search of moisture, which is very undesirable. Therefore, when the berries have set, a mulch should be applied. Rather fresh and littery stable manure is the best material; a coat about 6 in. thick may be given. The fertilizing properties in the manure will be washed in by rain or by watering, and no other fertilizer will be wanted. Failing manure, repeat the early dressing of sulphate of potash, and add blood-and-bone, 8 oz. per square yard. A mulch of some kind should be provided: this may be spent hops, straw, or any suitable material that is available.

Watering.

The grape-vine is a vigorous plant, and is expected to carry a fairly heavy crop of soft fruit which contains a good deal of water. If the vines are flourishing, the border will be full of roots, and a liberal supply of water must be assured. Outside borders rarely require watering till the stoning-period is past, and with inside borders watering should be of a minimum character during the stoning-period. It is after this time that the demand for water is greatest. When it is applied it should be in volume sufficient to penetrate the whole of the border. There is no danger of overwatering, provided drainage is good. If drainage is not good it is a defect that should be remedied the following winter. A thorough watering twice a week is sufficient for dry situations. It is a matter for which no hard-and-fast rule can be laid down; each grower must be guided by his own circumstances. Applications of liquid manure are advisable if the vines lack vigour. These should precede watering, so that the manurial properties may be washed down to the roots.

VARIETIES.

The appended list is confined to those varieties already in cultivation in this country that have given general satisfaction and can be most strongly recommended. It is not suggested that no other varieties are worth growing, but it is claimed that the varieties mentioned supply all purposes, and that any addition will be merely a matter of interest in varieties. The greater part of commercial crops is composed of two varieties—Black Hamburgh and Gros Colman. These two are without doubt the best varieties that can be selected, although occasionally a small proportion of other varieties is grown. In some cases, where the vinery is close to a large population, the crop is mostly disposed of direct to customers. In these cases it seems to pay to grow varieties of superior flavour, which, though not producing so heavy a crop, command a higher price, and, further, serve to popularize the establishment. Muscat Hamburgh, West's St. Peters, Mrs. Pince, and Muscat of Alexandria are among the best that can be grown for this purpose. The public taste in this country is for black grapes; there is little demand for white varieties. In private establishments white varieties are usually (and quite rightly) included, as this adds variety and interest to the supply.

Black Varieties.

Black Hamburgh: This is the most popular and most widely grown of all varieties. It does well in any form in which grapes are grown—in a cool or a warm house. Bunches and berries are handsome, and flavour excellent. It is to be understood that cultivation, regulation of the crop to the capacity of the vine, and general management influence the finish and consequent appearance and flavour of the berries. This does not, however, sufficiently account for the distinct shape of berries on different vines of Black Hamburgh, sometimes in the same house. The fact is, there are two varieties grown indiscriminately under one name. The variety most extensively grown is the Frankenthal Hamburgh, which is commonly known as Black

Hamburgh. It has numerous synonyms—Frankenthal, Frankenthal Hamburgh, Hampton Court Hamburgh, Black Tripoli, and others. The berries are roundish-oval or nearly oval.

Mill Hill Hamburgh: This variety is also known as Black Champion and Champion Hamburgh. It is distinguished from the former by having very strong laterals, while the berries are much larger, and when properly ripened have a hammered appearance. It is regarded as the most noble of the sweet-water grapes. Vines of this variety are fairly plentiful in New Zealand, grown as Black Hamburgh, the name being common to the two varieties.

Gros Colman: A thick-skinned vinous grape; berries very large and round, and should be jet-black when ripe. Flavour rather poor when first ripe; after hanging it becomes vinous and agreeable. In this country Gros Colman is the most extensively grown variety for late use.

Gros Maroc: A very handsome grape when well grown. Berries ovate, very large, pleasantly flavoured, and vinous. Ripens soon after Black Hamburgh and succeeds in the same conditions.

Madresfield Court: A muscat, with handsome bunches; large berries of rich flavour. Does not hang well, being liable to crack and to lose colour.

Muscat Hamburgh (synonym, Snow's Muscat): An oval-berried muscat with rich flavour. Does well grown with Black Hamburgh; ripens soon after that variety. Does not hang long after it is ripe. Not a commercial variety, but private vineries should include a rod or two.

West's St. Peters: A first-class late grape of the vinous class. Specially recommended for invalids, the fruit being very refreshing. Berries roundish-oval, medium size; skin very thin.

Mrs. Pince: A high-class late muscat. Berries medium size, oval or oblong. Skin thick and tough; flesh firm, crackling, vinous, and rich, with a fine muscat flavour. An excellent keeper, though apt to shrivel and lose colour. Requires a warm house.

White Varieties.

Duke of Buccleugh: The most handsome of the white sweet-water grapes. Bunches large; berries large, roundish-oval, colouring a rich amber. Ripens slightly before Black Hamburgh, with which variety it can be grown, but it should be in the warmest part of the house.

Muscat of Alexandria: Considered to be the finest-flavoured of all grapes. The oval berries should be golden-amber when ripe. Requires a warm house, and is very much affected by unsuitable conditions at root or top. Does fairly well in unheated houses in this country.

Mrs. Pearson: A round-berried muscat of first-class quality. Late, keeps well, and easy to grow.

Pearson's Golden Queen: A vinous grape; berries above medium size, oval; bunches handsome. A good variety that does well in most places. Season late; hangs fairly well.

(To be continued.)

TESTING OF PUREBRED DAIRY COWS.

DECEMBER CERTIFICATE-OF-RECORD LIST.

THE following list, comprising the records of cows which qualified for certificates during December, 1922, is supplied by the Director of the Dairy Division, Mr. W. M. Singleton:—

LIST OF RECORDS.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		Yrs. dys.	lb.		lb.	lb.
FRIESIANS.						
Junior Two-year-old.						
Dominion Pride of Weraroa	Central Development Farm, Weraroa	2 78	248·3	365	15,686·2	511·63
Cordyline Betsy de Kol	James Dow, jun., Outram	2 47	245·2	354	13,725·6	501·00
Wyndham Morpeth Countess	Gibb Bros., Clifton ..	2 32	243·7	365	11,705·75	471·50
Bloomfield Netherland May	Bloomfield Farm Company, Wellington	1 352	240·5	365	11,266·7	459·79
Tokaora Alcartra ..	H. E. Johnson, Tokaora	2 46	245·1	356	13,703·9	430·20
Tokaora Lassie ..	H. E. Johnson, Tokaora	1 363	240·5	365	13,530·2	419·33
Colinton Lorna ..	R. Colee, Greendale ..	2 14	241·9	340	10,212·9	410·36
Martha Pauline Veritas	W. Barton, Featherston	2 95	250·0	364	14,201·7	404·98
Bloomfield Peace de Kol	Bloomfield Farm Company, Wellington	1 353	240·5	365	13,111·0	393·71
Longview Adeline Segis	C. R. Duncan and Sons, Whangamarino	2 24	242·9	365	9,410·2	361·61
Colinton Polly ..	R. Colee, Greendale	1 284	240·5	365	10,143·2	340·02
Dominion Olgapatch	Central Development Farm, Weraroa	2 54	245·9	365	9,826·4	331·13
Paul's Princess of Braystone	Knight and Sons, Ongarue	2 91	249·6	310	8,558·5	328·12
Ashlea Grace Pietertje Pontiac	R. Colee, Greendale ..	1 346	240·5	321	9,260·6	320·47
Ashlynn 70th ..	Piri Land Company, Auckland	1 361	240·5	365	7,910·7	315·30
Fairview Black Spot	Mrs. T. E. F. Hardwick, Kennington	1 216	240·5	360	9,582·9	309·16
Konini Startle 3rd ..	R. Colee, Greendale ..	1 332	240·5	232	7,354·7	255·95
Senior Two-year-old.						
Martha Johanna Elgin	W. Barton, Featherston	2 296	270·1	362	13,833·4	436·65
Ashlynn 34th ..	Piri Land Company, Auckland	2 342	274·7	365	9,961·3	396·02
Oaklea Segis Bonnie	Knight and Sons, Ongarue	2 270	267·5	310	8,553·9	325·86
Junior Three-year-old.						
Cordyline Colantha Cremona	George Aitchison, Kaitangata	3 26	279·6	328	14,898·0	576·00
Ryvington Quick ..	Estate of T. O. Hodgson (deceased), Tamahere	3 37	280·7	365	14,255·8	555·34

LIST OF RECORDS—*continued*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS—*continued.*					
Senior Three-year-old.		Yrs. dys.	lb.		lb.	lb.
Medbury Woodcrest Domino Maid	H. Johnson, Stratford	3 286	305·6	337	13,625·0	551·66
Colinton Tui ..	R. Colee, Greendale ..	3 337	310·7	365	11,051·4	468·93
Junior Four-year-old.						
Baintield No. 16 ..	W. D. Hunt, Invercargill	4 127	326·2	365	20,917·5	728·13
Ashlynn Mag ..	Piri Land Company, Auckland	4 107	324·2	365	15,206·5	489·44
Fairview Nellie Segis	Mrs. T. E. F. Hardwick, Kennington	4 36	317·1	326	12,631·2	409·07
Senior Four-year-old.						
Carlowrie Maid ..	R. K. Macdonald, Edendale	4 346	348·1	365	17,454·5	542·77
Mature.						
Dominion Olga 2nd..	Central Development Farm, Weraroa	5 194	350·0	346	15,539·7	568·02
Ongarue Netherland	Knight and Sons, Ongarue	5 46	350·0	341	16,148·3	553·01
Waihou Queen ..	Cameron Bros., Stratford	8 47	350·0	317	15,233·9	519·76
Carlowrie Princess Domino	R. K. Macdonald, Edendale	5 243	350·0	365	15,425·5	500·17
Riverlea Maudie de Kol	Knight and Sons, Ongarue	7 280	350·0	353	12,083·2	445·82
Colantha La Favourite	Marchant and Sons, Cardiff	7 51	350·0	183	13,733·8	443·05
Dominion Imarose ..	Gibb Bros., Clifton ..	5 0	350·0	334	13,104·0	412·88
Dominion Domino's Dutch Girl	Central Development Farm, Weraroa	6 59	350·0	306	11,717·9	364·16
	JERSEYS.					
Junior Two-year-old.						
Princess of Rosy Creek	A. and J. O'Donnell, Hawera	2 87	249·2	365	9,018·8	554·90
Oakland's Belle Mahone	F. W. Cornwall, Bell Block	2 83	248·8	365	8,564·8	553·22
Charm's Clematis ..	J. O'Donnell, Bunnythorpe	1 348	240·5	365	8,696·7	506·81
Holly Oaks Pretty ..	H. H. Sutton and Co., Masterton	2 56	246·1	365	8,788·0	500·09
Fern's Golden Princess	H. H. Sutton and Co., Masterton	1 282	240·5	365	8,376·7	483·18
Viola's Golden Fern	R. Cobbe, Feilding ..	2 48	245·3	348	7,948·9	470·65
Viola's Queen Bess ..	R. Cobbe, Feilding ..	1 293	240·5	365	7,016·3	460·32
Violet's Gem ..	G. Hodgson, Whakapara	1 290	240·5	343	7,513·9	458·33
Falconite's Joy ..	T. Pollock, jun., Pukekohe	2 57	246·2	365	9,843·2	450·34
Lady Celia ..	E. Joyce, Kaponga ..	1 227	240·5	345	7,103·0	446·20
Eileen Silverskin ..	F. V. Bryant, Ruawhata	1 301	240·5	365	9,571·9	445·64

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat Equal for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Woodlands Gipsy ..	H. C. Sampson, Hillsborough	1 339	240·5	305	7,262·3	440·25
Daphne Renown ..	F. V. Bryant, Ruawhata	2 23	242·8	354	7,871·5	438·75
Irene's Goldie ..	A. Buchanan, Palmerston North	1 362	240·5	305	7,722·1	435·48
Rosa's Ripple ..	A. Buchanan, Palmerston North	2 68	247·3	317	7,315·0	427·51
Rewa Facility ..	D. Wishart, jun., Ryal Bush	2 2	240·7	365	7,527·2	426·72
Woodstock's Midget	A. Banks and Son, Kiwitea	2 19	242·4	365	8,085·5	417·77
Golden Aureola ..	F. Gough, Awakeri ..	1 334	240·5	365	7,982·3	416·50
Rewa Queen ..	W. H. Hall, Carterton	2 6	241·1	365	8,469·7	403·46
Meon Avis	C. H. Weston, New Plymouth	2 1	240·6	363	6,446·4	384·60
Meon Aster ..	C. H. Weston, New Plymouth	1 351	240·5	365	6,092·0	354·28
Poplarvale Chetnol Bud	R. C. Henry, Bell Block	2 24	242·9	365	5,596·8	350·70
Conqueror's Clematis	H. R. Benbow, Ormondville	2 41	244·6	329	6,219·8	349·96
Physalis	R. C. Henry, Bell Block	1 357	240·5	365	5,266·2	335·33
Kudos Doreen ..	E. Harding, Woodville	1 334	240·5	347	5,326·5	314·69
Senior Two-year-old.						
Silver Buttercup ..	H. H. Sutton and Co., Masterton	2 236	274·1	365	9,412·7	513·44
Treasure's Patch ..	H. H. Sutton and Co., Masterton	2 104	250·9	365	9,760·5	501·43
Winter Nellis ..	H. H. Sutton and Co., Masterton	2 147	255·2	365	8,529·0	496·18
Woodstock's Spright	A. Banks and Son., Kiwitea	2 314	271·9	365	9,527·6	471·92
Sweetest Joy ..	Mrs. M. A. Rogers, Katikati	2 294	260·9	342	6,788·9	377·78
Woodstock's Floss ..	A. Banks and Son, Kiwitea	2 353	275·8	296	6,312·5	340·71
Thistle of Bull's ..	F. J. Watson, Bull's ..	2 201	260·6	365	5,302·6	328·56
Three-year-old.						
Lucretia	H. R. Benbow, Ormondville	3 352	312·2	365	8,826·7	515·09
Sunny Meadows Fantail	F. J. Wyatt, Towai ..	3 38	280·8	365	7,539·8	505·04
Woodstock's Fairy ..	A. Banks and Son, Kiwitea	3 46	281·6	365	9,090·6	490·49
Aratika Varna ..	D. Kennedy, Morven	3 38	280·8	365	8,222·0	476·42
Woodstock's Bright Eye	A. Banks and Son, Kiwitea	3 359	312·9	365	6,987·3	455·32
Coronet	D. L. A. Astbury, Mangatoki	3 301	307·1	365	7,898·3	446·86
Worksop Silver Thread	J. W. Beagley, Woodville	3 68	283·8	364	7,428·7	404·85
Waipiko Priscilla ..	J. C. Hare, Cheltenham	3 13	278·3	365	8,257·6	404·45
Majesty's Orange Fox	R. R. Dean, Te Kuiti	3 16	278·6	261	7,037·3	355·82

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		Yrs. dys.	lb.		lb.	lb.
JERSEYS—*continued.*						
Four-year-old.						
Butter Boy's Flower	E. Joyce, Kaponga ..	4 13	314·8	364	8,191·6	523·99
Undean's Star Lady	J. Fulton, Whangarata	4 20	315·5	365	9,769·7	520·68
Woodstock's Fanatic	A. Banks and Son, Kiwitea	4 88	332·3	326	9,433·3	492·12
Golden Fern's Queen	R. Cobbe, Feilding ..	4 350	348·5	315	9,390·0	466·11
Mature.						
Ngatina	F. C. Starck, Normanby	5 31	350·0	365	12,939·9	718·59
Chelsea Flower ..	Thos. Church, Te Rapa	8 71	350·0	365	12,296·1	708·45
Charming Irene ..	C. Stevens, Maungatapere	6 257	350·0	357	12,042·0	702·67
Buttermilk ..	H. B. Lepper, Lepperton	9 29	350·0	365	10,720·75	660·95
Flossie Deem ..	T. Pollock, jun., Pukekohe	7 63	350·0	365	15,728·0	643·65
Agatha	C. Stevens, Maungatapere	7 327	350·0	350	10,204·3	594·50
Signal's Queen ..	John Hale, New Plymouth	9 64	350·0	365	11,991·5	588·79
Lady Joyful ..	C. Stevens, Maungatapere	6 252	350·0	365	10,478·7	569·90
Woodstock's Baby ..	A. Banks and Son, Kiwitea	7 18	350·0	365	10,980·5	540·46
Lucy Grey.. ..	G. Hodgson, Whakapara	6 346	350·0	365	9,620·2	537·77
Reid Park's Queen ..	G. Bright, Otaua ..	6 99	350·0	310	8,091·1	484·17
Golden Floss ..	A. Banks and Son, Kiwitea	8 343	350·0	365	11,336·1	475·23
Ana	K. M. Stevens, Maungatapere	8 3	350·0	356	8,742·8	469·66
Woodruffe.. ..	F. J. Saxby, Ohaupo..	15 276	350·0	365	8,627·9	436·01
Rewa Maize ..	H. Stonex, Bell Block	5 66	350·0	365	7,526·0	425·76
Edgely Noble Lily ..	S. R. Lancaster, Palmerston North	6 137	350·0	365	8,056·75	408·42
MILKING SHORTHORNS.						
Junior Two-year-old.						
Newstead Daphne ..	Samuel Lye, Newstead	2 31	243·6	365	9,771·1	376·24
Newstead Rebecca ..	Samuel Lye, Newstead	2 0	240·5	365	8,566·0	366·12
Newstead May ..	Samuel Lye, Newstead	1 339	240·5	362	8,112·7	329·37
Newstead Jean ..	Samuel Lye, Newstead	2 54	245·9	358	7,324·9	314·88
Newstead Dairymaid	Samuel Lye, Newstead	2 22	242·7	333	5,917·5	256·57
Newstead Gem ..	Samuel Lye, Newstead	1 351	240·5	365	6,396·0	242·43
Senior Two-year-old.						
Dominion Armistice of Ruakura	Ruakura Farm of Instruction, Hamilton	2 318	272·3	320	9,259·7	342·13
Dominion Bianca of Ruakura	Ruakura Farm of Instruction, Hamilton	2 285	269·0	344	8,465·1	327·06
Junior Three-year-old.						
Dominion Carnation of Ruakura	Ruakura Farm of Instruction, Hamilton	3 9	277·9	348	9,942·6	439·20
Dominion Attraction of Ruakura	Ruakura Farm of Instruction, Hamilton	3 11	278·1	344	10,222·3	409·84
Newington, Jean ..	Samuel Lye, Newstead	3 0	277·0	298	9,192·5	356·18
Senior Three-year-old.						
Matangi Cherry 1st ..	Ranstead Bros., Matangi	3 345	311·5	351	8,419·6	360·77

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	MILKING SHORTHORNS—*continued.*					
Junior Four-year-old.		Yrs. dys.	lb.		lb.	lb.
Cloverlea Harriett 4th	D. Buick, Palmerston North	4 143	327·8	334	10,651·6	410·31
Cloverlea Harriett 2nd	D. Buick, Palmerston North	4 27	316·2	346	8,486·8	325·97
Mature.						
Studleigh Nancy Lee	D. Buick, Palmerston North	7 257	350·0	365	17,177·5	623·37
Sunnyside Beauty 4th	Sunnyside Mental Hospital	6 37	350·0	354	11,398·2	466·27
Braeburn Cherry ..	Samuel Lye, Newstead	..	350·0	365	9,913·0	424·44
Daphne 6th	G. H. Hadfield, Paraparaumu	10 164	350·0	332	8,983·1	379·83
Aloe 18th	Samuel Lye, Newstead	8 39	350·0	292	10,180·5	357·68
	AYRSHIRES.					
Three-year-old.						
Dominion Cherry Bloom	Moumahaki Experimental Farm, Waverley	3 342	311·2	298	9,698·0	338·89
Heather Bell of Elmwood	C. B. Morgan, Ngawapurua	3 33	280·3	365	7,577·4	334·08
Four-year-old.						
Greenfields Lassie ..	C. E. C. Webb, Koputaroa	4 325	345·5	365	12,095·7	473·50
Mature.						
Greenfields Mary ..	C. E. C. Webb, Koputaroa	5 339	350·0	365	12,834·8	534·20
Dominion Cherry 1st	Moumahaki Experimental Farm, Waverley	6 113	350·0	327	11,314·2	449·37

Second-class Certificates.

	JERSEYS.					
Junior Two-year-old.						
Silverley's Ambition	J. S. Jones, Bell Block	1 302	240·5	365	6,988·5	381·62
Four-year-old.						
Madam Bush Nora ..	F. J. Saxby, Ohaupo	4 282	341·7	365	9,464·9	567·38
La Pisa	O. Monrad, Palmerston North	4 31	316·6	360	9,232·35	459·12
Mature.						
Silver Pride ..	J. S. Rae, Taneatua ..	5 262	350·0	364	7,668·0	448·81
Fortuna's Rosy ..	S. R. Lancaster, Palmerston North	5 81	350·0	365	7,340·5	434·13
	FRIESIANS.					
Junior Two-year-old.						
Eve Beauty ..	R. Colee, Greendale ..	2 36	244·1	365	7,713·5	320·57
Senior Three-year-old.						
Ardmore Plum 3rd ..	W. Potter, Mangere ..	3 330	310·0	364	12,268·7	424·28
Mature.						
Quickshine ..	H. E. Johnson, Tokaora	6 4	350·0	365	18,639·0	593·87

SEASONAL NOTES.

THE FARM.

FIELD CROPS AND PASTURES.

Cereal Harvest.

HARVEST operations will be continued in most districts during February. In some parts threshing from the stook is practised, but unless the weather is very settled it is much safer to stack the material. When grain is stacked it sweats more or less, and here judgment is required if the grain is to be saved in the best of condition. It should either be threshed at once or allowed to lie in stack a sufficient length of time for the grain to harden after the sweat, about a month being the minimum.

The oat crop, which plays such an important part in the farming practice of south Otago and Southland, will, by the beginning of the month in many parts of those districts, be ready for cutting. This operation is best commenced when there is a considerable amount of green tinge on the ear, as the crop ripens considerably when standing in the stook. Any loss which may occur from cutting too green is practically negligible when compared with what generally happens from shedding before reaping is finished, in the case of overripeness.

Catch-crops.

Green crops for autumn and winter feeding—such as barley, oats, or wheat, or one of these cereals in conjunction with tares or crimson clover—may be sown towards the end of February. If very quick feed is required, Black Skinless barley will be found the best, but where the feed is required during the winter and early spring Algerian oats will probably give better results. Where crimson clover is to be used in conjunction with a cereal the latter should be drilled in at the rate of 2 bushels per acre, and the crimson-clover seed then broadcasted at the rate of 10 lb. per acre and rolled in. A mixture of this sort will provide good feeding late into the spring; but where convenient it is good practice to feed until August, then let the clover come away for a few weeks and turn it under as green manure. Here, again, the farmer will have to be guided by the subsequent use he intends to make of the land.

Autumn-sown Grass.

Where it is intended to sow down autumn grass the ground for that purpose should be broken up and prepared in readiness for sowing. It is highly desirable to carry out this operation as early as possible, in order that the dry soil and hot sun usually experienced in February may kill out weeds, leaving the paddock more or less clean. Then when the autumn rains arrive and fall upon the warm ground ideal conditions are given for the establishment of the pasture. Too often one observes farmers endeavouring to sow fine grass-seed on badly prepared, rough, bumpy ground, and, as is to be expected, a poor strike is usually the result. A fine tilth is necessary if a good close sward is to be formed, and the aim should be to obtain a good germination, thus preventing the intrusion of deleterious weeds. When a pasture is expected to last for several years it pays to give it every chance, and a reasonable amount of fertilizer applied with the seed will more than return the initial expenditure.

The constitution of the grass-seed mixtures should receive careful consideration. One of the great weaknesses of much of our permanent pasture is the small amount of cocksfoot and red clover appearing in it, and thus it provides little autumn feed. If a liberal amount of cocksfoot is sown, the perennial rye-grass in the mixture should be considerably reduced to allow of the establishment of the cocksfoot. An excellent temporary pasture, affording an abundance of good succulent food in the early spring, may be obtained by sowing down in February or March a mixture of, say, 25 lb. of Western Wolths rye-grass and 4 lb. alsike clover. A corresponding mixture of Italian rye-grass and red clover is a good alternative.

Turnips and Potatoes.

Turnip crops may be thinned during the coming month. The most economical way of doing this is to run the harrows lightly across the field. As regards cultivation, by giving a scuffling during February moisture is conserved in the soil just at the time when the crop usually suffers most from the lack of it.

In the later districts potatoes should be given their last cultivation. This being essentially a cleaning crop, it pays to keep the cultivator going as long as possible. Preparations should be made for saving seed from the main crops. Only those tubers free from disease should be selected, and although the storage of immature seed is not always easily accomplished such seed usually gives the best results. Medium-sized seed about the size of a hen's egg is the most suitable.

Lucerne.

February is a good month for destroying weeds and grass in dirty stands of lucerne. As the lucerne is cut the land should be cultivated. If clean, a stroke of the tine harrows to keep the soil free is all that is required; but if dirty, stronger methods must be adopted. Young lucerne crops sown in November and December should be ready for cutting about the end of February, and will greatly benefit by a cultivation to keep the land free and destroy weeds. Under Canterbury conditions it is generally found economical to graze the last growth of established stands of lucerne. As a haying proposition the cut is so light that it does not pay for working-expenses. As soon as growth ceases, the land should be stirred with the grubber.

If the weather is seasonable February is generally a favourable period for sowing lucerne. Compared with spring sowing, more time is available for destroying weeds, and there is less likelihood of a cold wet spell of weather following closely on the germination of the lucerne-seed and so checking the growth of the young plants. A frequent mistake in lucerne-culture is that of sowing too deeply. Very often one sees the ordinary tine harrows being used for this purpose, with the result that a large proportion of the seed is buried. A light brush harrow, or one made from strips of wire netting laced together and weighted at the end with bolts, will be found more satisfactory for covering the seed.

As regards irrigated areas, it is important to bear in mind that sowing should follow irrigation, and not *vice versa*, otherwise the ground will be left in a cold damp condition unsuitable for the germination of the seed.

Feeding of Dairy Cows.

Supplementary green feeding of dairy stock will now be fairly general, and where such crops as lucerne and maize have been provided in conjunction with soft turnips, the fodder should be carted out during the day into different fields. The cows could then have the lucerne or maize for an evening meal after milking, and the turnips after the morning milking. It is difficult to lay down definite quantities, but from 40 lb. to 60 lb. of turnips may be given daily, and as much maize or lucerne as the stock will clean up nicely. Much depends on the condition of the pastures, and the farmer must use his own judgment.

Noxious Weeds.

Clearing of noxious weeds should be continued. Californian thistle will be flowering in many districts, and cutting should be carried out before the seeds are distributed broadcast by the wind. The second growth of ragwort will also require attention, and the flower-heads of this weed must be dealt with.

—*Agricultural Instruction Service.*

FAT-LAMB BREEDING: THE DOWNS AND DOWN CROSSES.

The question often arises, which breed of sheep is best for fat-lamb production? The present time, when many farmers are considering the purchase of rams and breeding arrangements generally, may be opportune for a few notes on the subject.

Points and characteristics which it is essential that any breed should possess before it could be termed the best for the purpose in question are squareness and compactness of frame; well-barrelled ribs; very full hind quarters, with the meat

coming well down on the legs, thus leaving only a short shank; and the quality enabling a large proportion to be sold straight off the ewes. We have in the Dominion four of the leading Down breeds, whose special feature is meat-production—easy and quick fattening, and the production of a large percentage of milk lambs. These breeds are the Southdown, Shropshire Down, Suffolk Down, and Dorset Down. Each of the Down breeds has distinctive markings.

The Southdown markings are tan-coloured spots on the face, and most of the hair on the lower part of the legs is of the same colour. This breed is often referred to as "blackfaces," but the term is wrongly applied, as the breed with the black face proper is the Suffolk. The Southdown breed complies with all that is required for mutton or the fat-lamb trade. The body is square, compact, and set close to the ground. The bone is light, and the leg of mutton ideal. It has been found repeatedly that the Southdown is the quickest to come to hand for market, and that land will carry more head per acre than with most of the other breeds. It is ready a fortnight to three weeks earlier (the saving of that amount of feed alone being an important point, more especially if the season is a dry one), and a very large percentage of the lambs can be sold direct off the ewes.

Then, there are the first-cross lines produced by mating Southdown rams with other ewes. The cross produced from the Southdown ram on either Corriedale or half-bred ewes is an excellent, good-selling line. The lambs fatten quickly, and the meat is fine in the grain and of sweet flavour. In the North Island large numbers of Southdown rams are used for mating with Romney ewes. The line produced is a good one and always in demand. The Southdown ram is also used with other lines of ewes for producing fat lambs, but it is noticed that the coarser-wooled the breed of ewe used, the longer the lamb takes in being got ready for market on the same class of feed. The number of Southdown rams in the North Island, as shown by the 1922 sheep returns, is 18,584, and in the South Island 2,329, making a total of 20,913 for the Dominion.

The Shropshire is a larger-framed sheep than the Southdown. It also has the desired characteristic of fattening early, but takes a little longer than the Southdown. Large numbers of Shropshire rams are used for mating with other lines of ewes. The cross produced when mated with either Corriedale of half-bred ewes is a good line. They come to hand early and make an excellent carcase. The cross produced when the Shropshire ram is mated with any of the long-woolled ewes takes longer to get ready for the market. The coarser the breed of ewe, the longer does the lamb take to fatten up on the same class of feed. The Shropshire's distinctive markings are black round the eyes, black on the lower part of the face and under the jaw, and mostly black on the lower part of the legs. The number of Shropshire rams is 912 in the North Island and 2,457 in the South Island, a Dominion total of 3,369.

At present there is only a small number of Suffolks in New Zealand. The breed is a prime mutton line; the lambs come to hand early, and, like the rest of the Down family, usually command the best ruling prices. The Suffolk markings are face and head completely black in colour, the head being clear of wool, giving the sheep a bald-headed appearance. The lower part of the legs are all black, and, as mentioned, this breed could more rightly be termed "blackface" than the Southdown.

The few Dorset Downs in the Dominion were imported last year, the number consisting of two rams and five ewes, and the progress of the breed here will be watched with interest.

Some farmers adopt the good practice of mating any ewes (either cull or aged) which they are going to keep for the lambing season only with Down rams, and, when ready, the ewes and lambs are either sold separately or as one line ("all counted"). Farmers who use their place only for raising fat lambs commonly buy up almost any line of ewes, mate them with Down rams, and, when either the ewes or lambs are ready, sell them. By working in this manner the farm can be given from two to three months' spell before the next new lot come on the place.

Other breeds and breeding for fat lambs will form the subject of future notes.

—J. G. Cook, Live-stock Division.

THE ORCHARD.

HARVESTING THE PIP-FRUIT CROP.

WHILE small lines of early pip-fruits have been picked during the past month (Beauty of Bath apple was ready for the Christmas market in some localities), it is not until the month of February that the harvesting of the main crop of pip-fruit commences.

The modern practice of using more care and discrimination in picking the fruit has given most gratifying results, especially with the earlier-ripening varieties. This is a difficult art, however, owing to the widely differing habits of varieties and the different uses to which the fruit is to be put. But much of the loss in transit and storage, and of the disappointment to buyers and consumers, will be avoided if the pickers are carefully instructed and supervised.

For export purposes experience has shown that if pip-fruits are picked at the first sign of maturity, and afterwards receive proper treatment, their keeping-qualities are greatly enhanced. Practically all the Cox's Orange, Golden Pippin, Scarlet Pearmain, Worcester Pearmain, and Allington Pippin apples were away from Nelson about the middle of February last year. While awaiting shipment they were in the cool store, and on arrival in London opened up in good condition.

It is very tempting to simplify the work by making one picking of the crop, but it is not possible to do so successfully; a large proportion will have reached maturity, while the balance is immature.

Pickers will earn the gratitude of the packing-shed staff and save a great deal of unnecessary work if all really waste fruit is not put into the boxes but is dropped at the foot of the trees. It is tiresome for graders to have to cull it out of the better qualities when it obviously is only suitable for pig-feed. At the end of the harvest a number of such young animals will find good grazing in many an orchard for a considerable period.

PACKING FOR EXPORT.

The export-fruit pack is generally very commendable; a tendency to slackness is the commonest defect. A box so packed is very quickly filled, but it weighs light, and the fruit is subject to bruising. The fruit, when packed, must stand only a very little above the edge of the box, but it must be very firmly and solidly packed by means of careful grading and fitting. Such a pack takes longer to put up, but is then satisfactory in every way.

Consignees still charge us with marking a large proportion of our cases in such a manner that the marks are not legible—at any rate on arrival at destination. This is a very serious charge, as any one who has had to sort and handle a large quantity of fruit knows. One can only come to the conclusion that dressed ends on the cases are a necessity whether stencilling is done or a label is used. The latter method is given a very strong preference by London agents. There is considerable art in getting labels to dry on smoothly and tightly. The first requisite is a good paste, which is best mixed with cold water and then heated till cooked. Another is to allow the label to saturate before application, and finally brush out all air-bubbles.

GENERAL.

The trees will now be bearing down with the weight of the fruit, and cultivation will soon have to cease. To maintain fertility where heavy crops are borne, to supply humus to soils where this is lacking, or to smother bad weeds such as couch-grass or twitch, a cover-crop may be sown now with great advantage. Usually a moderate dressing of superphosphate or other manure is given at the same time.

Little other work can be done during the harvest, but when spare moments are available keep a good lookout for developments in the orchard, and clean up the trees with a good spraying as soon as the crop is off; an excellent chance is then afforded of dealing with aphis and red mite.

This is the best time of the year for budding orchard-trees.

—W. C. Hyde, Orchard Instructor, Nelson.

CITRUS FRUITS.

Weather conditions have been exceptionally moist for this season of the year, and citrus groves have benefited thereby. However, this has caused an abnormal growth of weeds. As soon as a favourable opportunity presents itself these should be dealt with by thorough cultivation. The second delayed application of bordeaux, 4-4-40, may still be applied for control of fungoid diseases.

FIREBLIGHT.

Attention is drawn to the fact that fireblight, among other diseases scheduled in the Orchard and Garden Diseases Act, 1908, is notifiable to the Department of Agriculture. Notification of the appearance of the disease must be immediately made to the office of the District Orchard Instructor. Failure to comply may render any person liable, on conviction, to a penalty of £20. It is as well to remind growers of fruit-trees generally that the onus rests upon them, under the Act, to see that all reasonable steps are taken to have their trees kept free from the disease. Those occupiers of orchards who fail to effectively comply with the provisions of the Act in this respect are liable to the same penalty as above quoted.

—J. W. Collard, Orchard Instructor, Auckland.

POULTRY-KEEPING.

DISPOSAL OF SURPLUS STOCK.

At the present time, on the majority of plants, the housing and run accommodation will be taxed to the utmost. On top of this the young stock are rapidly developing, and are day by day making greater demands on the accommodation available. Hence the necessity of weeding out every bird that is not likely to show a profit over its keep. If the evils resulting from overcrowding are to be prevented, and if the most money is to be made from the plant, this is a matter that the poultryman cannot afford to ignore. Especially does this apply in the case of surplus cockerels. Be it ever remembered that the most profitable period to market a cockerel is at an age of four and a half to five months. Of course, this is not to say that because it has attained this age it is naturally in a prime table condition, or that the best price will be secured for it, for no profit can be made from a cockerel sold as a table bird if it has been neglected in any way or kept on a lean diet.

A cockerel should be fed and managed in such a way that it will rapidly lay on flesh and be in a prime condition at the age mentioned. In other words, as in the case of the fat lamb, it is the one brought rapidly on which is the most profitable. When a cockerel reaches an age of between four and a half and five months it commences to grow its adult feathers. Obviously, it cannot be expected to produce these and put on flesh at the same time. The production of a maximum weight of flesh in a minimum period of time is the ideal to aim for. A weakness on many plants in developing the market cockerel is in providing it with a mere living diet, or with a mash chiefly made up of green stuff, boiled potatoes, &c. As a means of reducing the cost of production these cheap foodstuffs may be sparingly included in the ration, but the best results cannot be obtained unless the great bulk of the ration consists of wholesome ground-grain material. The following mash is recommended after the priming process has commenced: Equal parts by measure of wheat-meal, maize-meal, and bran, the whole being mixed with milk or soup into a crumbly mass. Feed three times a day all that the birds will clean up. Green food should be fed separately during the day. Where milk is available this should be given in large quantities to drink. A good method of using skim-milk is to let it sour, pour off the whey, and boil the curd before feeding. Grit, of course, should be available to the birds at all times.

CULLING.

As to culling unprofitable hens, March is the best time of the year for doing this, but nevertheless some good weeding-out work can be done in February. True, it demands considerable judgment to safely cull at the latter time, but to the man who constantly works among his flock and thereby develops his powers of observation it should be a fairly easy matter to detect at a glance a bird that is failing in egg-production, a failing which is as often as not the result of a weak constitution.

Generally speaking, the bird that moults first should be the first to be culled. Then, in the case of yellow-skinned birds such as Leghorns, Rocks, Wyandottes, &c., it will usually be found that the legs of the good layer at this period of the year present a more or less bleached appearance. On the other hand, the legs of the poor layer will exhibit a bright-yellow colour. Nevertheless, there are exceptions to all rules. As an instance, a good layer which has been used during the season for the hatching and rearing of young stock, and which has not laid to her full producing-capacity, will in all probability retain the yellow pigment in the legs, as in the case of the bird not possessed of high producing-power. Thus, when the leg-colour is being taken as a guide to culling the unprofitable bird, local conditions must always be taken into account. In other words, it is a safe indication only where all members of the flock have been previously fed and handled in a similar manner. As is the case with early moulting, leg-colour is not always an indication of the conclusion of the individual fowl's normal laying-period. It is often caused through broodiness and allowing the bird to sit on the nest for weeks at a time.

Of course, a change of food or a change of quarters is apt to bring on an early moult at this period of the year. Some poultry-keepers, in accordance with advice given, are forcing their hens to moult now, and imagine that under this method the birds will come on to lay in the winter months. I know of many breeders who tried this scheme years ago, but who utterly failed in their objective. The birds moulted all right, but failed to lay when expected. In fact, they mostly moulted a second time before they resumed laying, by which time the cheap-egg season was approaching.

Poultry-keepers lacking in experience in culling and desirous of assistance are reminded that the services of the Department's Poultry Instructors are available for this purpose.

SIZE OF EGGS.

The only sound argument against high-type layers is that their eggs are often on the small side. There are exceptional cases where heavy producers lay eggs of a decent weight, but unfortunately the tendency is in the other direction. Indeed, far too many breeders are aiming for numbers, and are thereby failing to counteract the small-egg tendency which must in the near future have a very harmful effect on many strains of utility poultry. Many breeders are pinning their faith to an export trade as a means of relieving the summer surplus, but they will find that the critical oversea markets will not pay full rates for under-sized eggs, and only the best values will warrant an export business. Especially is it necessary to remember quality in initiating a trade. The warning is here, and the remedy is simple. Just as heavy-laying quality may be maintained and advanced by judicious mating, so the size of the egg may be maintained or increased in reason by the same process. A hen, however good a layer, should not be put in a breeding-pen if it lays a very small egg. The birds laying the best eggs should be chosen, providing, of course, their laying-capacity is satis-factory and they exhibit the desired points indicative of strong constitution.

As a means of tracing birds which lay good-sized eggs I cannot urge too strongly the use of trap-nests during the period from now until the breeding-birds are selected some time in March. A man with a trained eye for form can readily distinguish between the good and bad layer, but it is impossible to judge from the appearance of a bird the size of egg likely to be produced. It must be admitted that individual hens will sometimes lay eggs of varied size according to the season of the year, &c., but as a rule a normal product may be looked for just before the termination of the laying season. One of the secrets in main-taining a large-egg-laying strain is in knowing that the male is a son of a mother which produces an egg of the desired size. Obviously, this cannot be ascertained unless the use of trap-nests or single pens is resorted to. Full particulars of a simple style of trap-nest were published in the last March number of the *Journal*.

GREEN FOOD.

I would again emphasize the importance of losing no time in making every provision possible for the growing of ample green stuff for winter use. No flock can possibly thrive in its absence. It not only tends towards maintaining the birds in a healthy condition, but it also reduces the cost of the food bill. Any plants of the cabbage family are suitable for the purpose, while finely chaffed succulent green oats or barley will be relished by the birds during the late autumn and winter months.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

EXTRACTING.

If the bees have received adequate attention, and have been supplied with sufficient super accommodation, there should be some honey fit for extracting before the end of January. There will still be a flow of honey, however, and, consequently, more or less unripe honey in the hives; it will therefore be necessary to make a point of seeing that any combs taken from the hive for extracting purposes are sealed. While it may not be detrimental if an odd comb or two in an extracting is not fully sealed, the apiarist cannot afford to risk many combs with even a quarter of the honey unsealed. The safer course for the less-experienced beekeeper is to take off nothing but fully sealed combs.

Escape-boards are sometimes a convenience in taking off honey for extracting. Boards made for the greater part of wire cloth are preferable, as they permit of the warmth from the bees rising to the honey; such boards are obtainable from dealers in beekeepers' supplies. It will be necessary to see that there is no brood in the combs above the escape-board; the bees will not go down if any of the combs contain brood. If the boards are inserted late in the afternoon all the bees will have gone down to the brood-chamber before the following morning, and the honey can be taken off without disturbing them. When taking off honey keep a sharp lookout for signs of foul-brood.

The honey from diseased colonies should not be put through the extractor until all other extracting is finished. The combs from infected colonies should be destroyed after the honey has been extracted.

The Honey-house.—Most beekeepers who have only a few colonies of bees will make use of existing buildings for extracting. It will be necessary, however, to select a building that can be made bee-proof. If nothing better offers, a tent may be used for the purpose, provided it is made bee-proof. If necessary, floor-space sufficient to take the extractor, uncapping-can, and a few supers can be made to answer the purpose, but where it is practicable a floor-space of not less than 100 sq. ft. should be provided.

The Extractor.—A two-frame extractor will answer the purpose for anything up to fifty colonies. If the apiary contains nothing but full-size frames an extractor fitted with 10 in. reversible baskets should be selected, preferably one in which the baskets are removable by simply withdrawing a hinge-rod. While automatic reversing-gear is essential in the four-frame extractors, it is rather a detriment in the two-frame size; there is not sufficient room for both baskets to reverse at the same time as in the larger sizes, and in following each other they frequently jam. It is more satisfactory to reverse the baskets by hand. If half-depth frames are used, 12 in. baskets will be required.

The Uncapping-knife.—What is known as the Bingham knife is the one in general use. It is necessary to make some provision for keeping it warm, and this can be accomplished by immersing it in hot water. The simplest arrangement for providing this consists of a shallow tray about 3 in. deep, made by cutting a benzine-tin to that depth, heated by a single-burner Perfection lamp. It is an advantage to have two knives, so that one can be warming while the other is being used for uncapping the honey. A good steam-knife is preferable when there is sufficient extracting to warrant the outlay.

The Capping-melter.—A capping-melter is not essential, but it is a very useful adjunct. There are several melters on the market. Some are designed to deal not only with cappings but also with full-size combs of thick honey. If only the melting of cappings has to be provided for, one of the less-expensive makes is all that is required. The makers of the melter selected will advise as to the best means of heating. If the heat arising from the melter is found objectionable the combs of honey can be uncapped over an uncapping can or box, and the cappings allowed to drain for twenty-four hours before being melted. A hive-body, with strips $\frac{1}{2}$ in. square nailed at $\frac{1}{2}$ in. intervals across the bottom, placed in a tray with a lip provided at one end to drain off the honey, answers admirably as an uncapping-box. It is necessary also to nail a strip across the top to rest the frame of honey on while uncapping.

If the frames have a top bar $1\frac{1}{16}$ in. in width, cut right down to the top bar when uncapping; that is the natural thickness of a brood-comb. If the Hoffman frame or the simplicity frame with narrower top bar is used, proportionately less. After placing the combs in the baskets give the extractor a few sharp turns; then reverse the baskets and complete the extraction of the honey from the other side; again reverse the baskets, and complete the extraction of the honey from the side from which a portion was thrown by the first few revolutions.

Honey-tank, &c.—It will be necessary to provide a vessel of some description as a container for the honey after it has been extracted; the size will depend on the crop expected to be handled. A round galvanized-iron or tinned-steel tank 34 in. in width and 36 in. deep will hold half a ton of honey, and is a very convenient size for a small apiary. A strainer made of cheese-cloth or fine wire gauze will be required. The tank, which should be fitted with a 2 in. honey-gate, should be placed on a stand high enough from the floor to get a 60 lb. honey-tin comfortably under the tap. The extractor should be placed on a similar platform, and securely anchored with anchor-rods usually supplied with extractors. The honey should be allowed to remain in the tank for forty-eight hours, for the scum to rise, before it is run into the export tins or other containers.

TESTING THE HONEY FOR RIPENESS.

If all the combs taken from the hive have been fully sealed testing will be an unnecessary precaution. The bees are the best judges of the ripeness of the honey; they will not seal the combs until the honey is fully ripe. If, however, for any reason some unsealed honey has been extracted the honey should be tested with a Twaddle hydrometer. Full instruction in the use of the hydrometer is found in the Department's Bulletin No. 55, to which beekeepers are referred. This bulletin, which contains much information of value, is obtainable from the Department, price 6d.

—*H. W. Gilling, Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

THE most important seasonable work is to finish the planting of brussels sprouts, broccoli, cauliflower, savoys, cabbages, kales, and leeks. Experience has shown that unless planting is completed early in February at the latest, only partial development in these crops must be expected. Planting was dealt with in the *Journal* for last month.

Celery: In the warmer districts planting may be continued to the end of February. The self-blanching varieties answer best for such late planting, as they come in quickly; fine heads can be grown under the trench system. These varieties are not suitable for colder districts; they will not stand frost or even cold rains. Planting in such places should be completed early in January. Trenches are necessary to allow of moulding-up for blanching. Moulding or earthing up was in former times done a little at a time, as the plants increased in height, but comparatively few growers do so now, the plan not being at all suitable for New Zealand conditions. The lower leaves spread out to a nearly or quite horizontal position, and should be brought upright in the early stages of growth, otherwise they become rigid and cannot be brought up without injury. For this purpose a few inches of soil are returned to the trench—just sufficient to hold the lower leaves upright. This soil should not be applied in the ordinary way of moulding-up. The surface of the trench should be left level so that rain or applied water may reach all the roots. Moulding-up should be delayed till the plants are fully grown. Red spider and thrips at times attack celery, particularly in warm districts. These attacks can be prevented by maintaining sufficiently moist conditions of soil, and frequently spraying the plants with water. For leaf-spot and rust, spray every ten or twelve days with 2–2–40 bordeaux.

Tomatoes: Keep all side shoots nipped off; undue development of these is made at the expense of the fruit. Stop the tops beyond the fifth bunch of fruit. If the plants are growing very luxuriantly—a condition intimately connected with the class of fertilizer used and the amount of water in the soil—it will be wise to apply sulphate of potash. This may be given in water, using $\frac{1}{2}$ oz. per

gallon, or as a top-dressing, giving a ¼ oz. per plant and watering it in. If blight threatens, spray with Burgundy mixture—4 lb. bluestone, 6 lb. washing-soda, and 40 gallons water.

Asparagus: Cutting should have ceased before now; next season's crop depends on the growth made during summer. A thorough watering occasionally will be of the greatest benefit if the soil be dry. This may be preceded by a dressing of nitrate of soda, 1 oz. per square yard, and followed with a liberal application of liquid manure.

Rhubarb: Cease pulling stalks, and, if possible, give a mulch of stable or farmyard manure. This will have a more beneficial effect on the next crop than anything else that can be given.

Onions: Keep the soil free of weeds and the surface soil loose. No fertilizers should be applied at this time; they would prejudicially affect the ripening of the bulbs.

Advancing crops of parsnips, carrots, and red beet intended for winter use should be thinned as early as possible. Where sufficient provision has not been made, a further area may be sown at once. These will have time to reach a useful though not a large size.

French and butter beans may still be sown. Sow lettuce thinly in drills and thin out to 8 in. or 9 in. apart.

Shallots and garlic should be ready for lifting, this condition being denoted by the withered tops. They may not be ready, however, if planted late.

Potatoes: Those who intend to save their own seed should select tubers weighing from 2 oz. to 3 oz. each, selecting well-shaped tubers from hills giving the largest proportion of table-size tubers. Leave them in the sun a few days till the skin is green, then place them in shallow boxes and store away in situations that are light and airy, but protected from rain.

—W. H. Taylor, Horticulturist.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

TREATMENT FOR BLOWN COWS.

"SCEPTIC," Windsor, Oamaru:—

Could you inform me as to the risk likely to be incurred in the use of the trocar on a blown cow, or, in the case of a trocar being unavailable, the use of an ordinary pocket-knife? Please also state to what extent the following popular remedies can be relied on: Pouring cold water on the cow's back; giving a dose of about half a bottle of kerosene; giving a dose of milk and turpentine in the proportions of half a glass of turpentine to a bottle of milk; forcing a length of hose down the cow's throat.

The Live-stock Division:—

There is no danger in using a trocar, providing it is inserted in the proper position, which is at a point equally distant from the last rib, the bone of the loin, and the point of the haunch. In using a knife there is every likelihood of the gas escaping into the peritoneum and also under the skin, causing an emphysema, which is difficult to treat. As for the other remedies, cold water on the back would be of no benefit, but turpentine in milk is useful, or 2 tablespoonfuls of household ammonia in a pint of water. Inserting a piece of ½ in. hose-pipe through the mouth into the stomach will give relief by allowing the gas to escape, but the opening of the hose is liable to get blocked with food.

GETTING RID OF GIANT FESCUE.

"FESCUE," Kekerangu :—

Could you advise me as to the best method for getting rid of giant fescue? It is planted on a steep unploughable face, and has become so coarse that the cattle and sheep will not touch it. It was originally planted to prevent slips, but is now getting out of control, and is spreading over the flats as well.

The Agricultural Instruction Service :—

Your best plan would be to burn off the giant fescue and then stock heavily with cattle. The young shoots which come away after burning will be more palatable, and should be readily eaten by stock. The manure from the cattle should also help the other grasses to assert themselves.

PROPAGATION OF LOGANBERRIES.

"LOGANBERRY," Waitara :—

Will you please let me know if loganberries are likely to become such a pest as blackberries when grown in a farm garden or orchard, as the young plants seem to grow readily from fallen fruit, and the long shoots root at the ends similar to those of the blackberry?

The Horticulture Division :—

It is not anticipated that the loganberry will become a pest in the manner referred to. The tips of the long shoots root when in contact with the ground, but the plant does not stool out in the manner of blackberries. The general experience is that fertile seeds are not freely produced as in the case of blackberries. Young plants obtained by layering the tips of the shoots in autumn are ready for planting out in spring. They make more thrifty plants than those raised from cuttings of the shoots.

WEATHER RECORDS.

DECEMBER, 1922.

THE following general summary and rainfall statistics are supplied to the *Journal* by the Director of the Dominion Meteorological Office (Mr. D. C. Bates) :—

New Zealand may be said to have a number of climates, for, owing to its great length and lofty mountain-ranges dividing the greater part of its eastern coast from the prevailing westerly winds, remarkable differences appear in its climatic records. The effects of different atmospheric disturbances also prove interesting studies, and the changes of December almost defy brief analysis or general summary.

There were three disturbances at least from ex-tropical regions, and three or four distinct westerly or antarctic disturbances. Though these at times brought wind, yet it was not a stormy month, and the plentiful rains experienced on the eastern coasts, where they were much needed, were not so welcome in other parts.

One observer in the Manawatu reports: "December was a calm, moist, muggy month, with a rainfall 20 per cent. below the average. There were ten foggy days. The weather has been very irritating from a farmer's point of view—just too wet to allow of anything being done, and that right in the middle of the busiest part of the year. The hay crops are spoiling for want of a chance to get them in, and the early oat crops are in much the same position. The shearing is still dragging on—the weather on several occasions just falling short of being fine long enough to allow the sheep to get dry, and when it happened to be fine the wind did not blow."

From the Nelson district: "The month commenced with a cold snap. The weather during the remainder was cloudy, showery, and sultry—not like the usual Nelson weather. There was a lot of thunder around, but very little just about this immediate neighbourhood (Upper Sherry River). Little or no wind was felt until the 27th, when, after some rain, it commenced to blow from the west, and it was the heaviest wind felt round here for some time, taking a heavy toll from the crop of plums, apples, &c."

From Hanmer: "The month has been marked by three unusual visitations —*i.e.*, a fall of snow, 3 in., on the 1st, a terrific thunderstorm on the 16th, and an earthquake of great severity on the 25th. The rainfall, 6·15 in., was also unusual for this time of year."

An observer in Southland says, "We have experienced a dull, sunless, and very unsummerlike month."

Electrical conditions were prevalent on the 15th and 16th, and the cyclone which passed in the North about Christmas Eve may be generally regarded as a lucky escape from weather conditions which might have upset the holidays, for its path was fortunately northward of the Dominion, although it accounted for considerable wind and rain in the northern and east-coast districts.

RAINFALL FOR DECEMBER, 1922.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·26	11	2·0	3·28
Russell	3·67	12	0·98	2·05
Auckland	5·61	17	2·58	2·82
Hamilton	3·01	18	1·01	3·68
Kawhia	3·00	14	0·62	3·21
New Plymouth	3·95	15	1·18	4·28
Inglewood	6·86	19	1·56	7·72
Whangamomona	3·79	18	0·64	5·98
Tairua, Thames	5·52	11	1·96	4·30
Tauranga	2·50	12	1·18	3·39
Maraehako Station, Opotiki ..	4·24	13	1·00	2·82
Gisborne	6·65	11	2·04	2·13
Taupo	1·70	9	0·56	3·00
Napier	4·78	13	1·28	2·50
Taihape	4·40	14	1·31	3·43
Masterton	3·35	15	0·85	2·57
Patea	4·38	15	0·93	3·35
Wanganui	3·11	9	0·79	2·63
Foxton	1·94	10	0·37	2·17
Wellington	0·74	9	0·18	3·24
South Island.				
Westport	8·36	17	2·55	6·60
Greymouth	7·78	15	2·37	8·95
Hokitika	14·38	17	2·98	10·51
Arthur's Pass	15·47	12	3·75	12·02
Okuru, Westland	12·06	14	3·32	11·73
Collingwood	6·65	10	1·96	8·01
Nelson	1·29	8	0·42	2·70
Spring Creek, Blenheim	1·41	9	0·49	1·93
Tophouse	7·29	19	1·22	5·00
Hanmer Springs	6·15	11	1·70	2·89
Waiau	4·02	10	1·90	2·51
Gore Bay (North Canterbury) ..	4·22	9	2·48	2·12
Christchurch	2·21	8	0·95	2·03
Timaru	3·56	16	0·94	2·38
Lambrook Station, Fairlie ..	4·38	13	0·70	2·33
Benmore Station, Omarama ..	4·23	12	1·20	1·77
Oamaru	4·66	17	1·27	2·06
Queenstown	1·95	5	0·52	2·55
Clyde	2·81	15	0·68	1·79
Dunedin	3·98	18	1·18	3·49
Gore	4·32	18	0·88	3·36
Invercargill	3·76	18	0·90	4·36

EXPORT OF APPLES, 1923 SEASON.

CONDITIONS OF GOVERNMENT GUARANTEE.

CONDITIONS for the Government guarantee of legitimate marketing-expenses up to 11s. per case on shipments of apples have been formulated as follows :—

1. The guarantee to be limited to approved varieties and classes of fruit, packed in compliance with the requirements of the "Extra Fancy" or "Fancy" grades, and to be restricted to a maximum of 150,000 cases.

2. The Government's liability under the guarantee to extend to the same charges for packing, shipment, &c., as have applied in the past. In this connection local charges up to placing the fruit on to an approved coastal steamer or railway-truck not to exceed 3s. per case. All subsequent charges to be allowed, provided they are reasonable and necessary in connection with the placing of the fruit on the oversea market; further, that no allowance is made for cool storage unless an approved system of precooling is adopted, in which event such allowance shall not exceed 5d. per case; and, further, the insurance allowance shall not exceed that required to provide an ordinary marine-risk cover.

3. The guarantee to be limited to fruit grown and shipped on consignment by or on account of *bona fide* fruitgrowers or fruitgrowers' co-operative societies, through the New Zealand Fruitgrowers' Federation or other channel approved by the Minister of Agriculture.

4. The Government reserves to itself the right to limit the quantity of fruit shipped to any particular port should shipping accommodation, freight rates, or market conditions, &c., be deemed unsatisfactory.

5. All fruit to qualify for the guarantee must be passed by a Departmental Inspector, and must be packed in accordance with the export regulations, subject to the modifications hereinafter set out.

6. Payment of claims under the guarantee shall not exceed 11s. per case, and shall be calculated on the basis of the average price received by the claimant for the whole of the fruit exported on his account during the season, as against the average cost of placing such fruit on the market.

7. The Government reserves to itself the right—(*a*) to insist on all fruit being precooled prior to shipment, if deemed necessary; (*b*) to withhold the privileges of the guarantee from all fruit shipped in vessels the storage facilities of which are held by the Department to be unsatisfactory.

EXPORT REGULATIONS.

With respect to the export regulations, it has been decided to allow the following modifications as regards apples for the 1923 season :—

Classes.

The existing partial red and striped class will be separated, and a distinct striped class instituted. The colour requirements of the striped class will be 33⅓ per cent. and 20 per cent. respectively of good typical colour for "Extra Fancy" and "Fancy" grades.

Colour Standards.

Notwithstanding the provisions of the regulations, which will not be altered in this respect until further experience has been gained, apples carrying 10 per cent. less colour with respect to "Extra Fancy" and 5 per cent. less colour with respect to "Fancy" than is required by the regulations will be accepted during the 1923 season for export to Europe. The above reduction in colour will apply to all the classes, including the "striped" class above referred to.

Grades of Fruit.

In addition to the grades "Extra Fancy" and "Fancy," it has been agreed, on the recommendation of the Fruitgrowers' Export Committee, that apples conforming to the undermentioned "Good" grade will be approved for export for the 1923 season :—

"Good" grade: Apples of this grade shall be of not less size than $2\frac{1}{2}$ in. (175 apples per case), sound, smooth, and clean. They shall be mature, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Slightly blemished apples may be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by spray injury may also be included in this grade, provided that no individual apple shall have more than 10 per cent. of its surface affected thereby. The individual apples of "solid red," "partial red," and "striped" varieties shall carry not less than 30 per cent., 15 per cent., and 10 per cent. respectively of good typical colour. The individual apples of "yellow or green" varieties shall be of good characteristic colour.

The Minimum and Maximum Sizes of Apples for Export.

The minimum and maximum sizes of apples of "Extra Fancy" and "Fancy" grades approved for export shall be those set out against each variety respectively in the list of varieties approved for export.

Specifications of Export Apple-case.

The inside measurements of the export bushel case shall be 10 in. by $11\frac{1}{4}$ in. by $19\frac{3}{4}$ in.

Sizes of timber: The ends shall be made of boards of the following size—10 in. by $11\frac{1}{4}$ in. by $\frac{3}{4}$ in.; one-piece board at each end; both end boards to be planed on the outer side. The sides shall be made of boards of the following size—10 in. by $21\frac{1}{4}$ in. by $\frac{5}{16}$ in.; one or two boards optional for each side. The tops and bottoms shall be made of boards of the following size—11 in. by $21\frac{1}{4}$ in. by $\frac{5}{16}$ in.; one or two boards optional: Provided that tops and bottoms may be made of boards of the following size—11 in. by $21\frac{1}{4}$ in. by $\frac{3}{16}$ in., to be used with the addition of four cleats per case of size 11 in. by 1 in. by $\frac{5}{16}$ in.

Nailing: Nails used to be not less than $1\frac{1}{2}$ in. long, 14 gauge. Nails to be spaced not more than 3 in. apart, and the outer nails of each board to be not more than 1 in. from the edge of board.

Strapping: All cases to be strapped with a wire or steel band, such strapping to be tightly applied and to be not more than $1\frac{3}{4}$ in. from end of case.

Marking of Cases.

The centre of each end of the case is to be reserved for the application of the shipping-mark, which in each instance will be the broker's number, consisting of three figures. To enable some uniform system of marking to be adopted, as an aid to sorting out, the other essential particulars are to be placed in the same positions on each case respectively—namely, the grower's or packer's registered number in the lower left-hand corner, and the variety, grade, and size of the fruit in the lower right-hand corner, irrespective of whether stencils or labels are used. Where stencils are used, the accompanying facsimile of the stencil, reduced according to scale, is recommended for a registered export brand.

This example sets out the maximum and minimum wording required. "New Zealand" should be in not less than $1\frac{1}{4}$ in. lettering. The word "Apples" to be in not less than $\frac{1}{2}$ in. lettering. The grower's or packer's registered export number to be in the same-sized type as "New Zealand." "150" represents the number of apples in the case. This, together with the designations "Jonathan" and "Fancy," will require to be branded by means of rubber stamps, the lettering of which should be $\frac{1}{2}$ in. The shipping-mark "345," representing the broker's number, must be in large figures of not less than 3 in. Both ends of the case are to be branded alike. Paper labels, apart from any form of ornamental design, must also bear the wording represented by the stencil copy.

Should any grower or packer wish to use any other mark, such as the name of his orchard or packing-shed, such marks will have to be applied to either the lids or sides of the case, as it is essential that no other marks than those indicated be applied on either end.

Owing to the large number of exporters having on hand a supply of labels as used by them last season, approval may be given to use these for this season only, but all such labels will have to be overprinted or branded with the broker's number to whom they are shipping, in large figures of not less than 3 in. aforesaid.

Numerous complaints have been received regarding the careless manner in which the branding of a large number of cases was done last season, especially where rubber stamps and stencils were used, in many instances the words and figures being quite unintelligible. More care must be observed in future in this direction, or the Inspectors will be forced to exercise their powers in rejecting for export all cases not intelligibly branded.

Registered Export Number.

The "registered number" issued to all growers under the Local Market Regulations will be declared to be the grower's registered export number also. The registered number of each grower must be branded on each case of fruit exported by him.

In respect to fruit packed by a packing organization to which a registered number has been allotted, such consignments may be marked with the registered number of the packing association only, provided that each grower's fruit is shown separately on the advice-note for examination, and stacked in separate lots so that the Inspector may have no difficulty in determining which is the particular lot under examination. For example, a line of 100 cases of Cox's Orange coming from two different growers would be submitted as follows :—

Shipping-mark.	Registered Export Brand.	Number of Cases.	Kind of Fruit.	Variety.	Grade.	Size.
345	P607 ..	14	Apples ..	Cox's Orange ..	Fancy ..	163
		14	,, ..	,, ..	,, ..	175
		8	,, ..	,, ..	,, ..	188
		12	,, ..	,, ..	,, ..	210
		12	,, ..	,, ..	,, ..	225
	Total ..	60				
345	P607 ..	8	Apples ..	Cox's Orange ..	Fancy ..	163
		5	,, ..	,, ..	,, ..	175
		7	,, ..	,, ..	,, ..	188
		9	,, ..	,, ..	,, ..	210
		11	,, ..	,, ..	,, ..	225
	Total ..	40				

These would be stacked separately in two lots and examined as different lines.

Should unavoidable circumstances prevent the adoption of this procedure, resulting in a line comprising a larger number of cases being submitted as one line, it must be definitely understood that the examination of same would be solely at the grower's risk, and in the event of any fruit forming a portion of the line being found to be unsatisfactory the whole line would be liable to rejection.

Packing.

Wrapping-paper: Apples of the various sizes as set out below shall be wrapped in paper of the size indicated opposite each respectively :—

Sizes 64's to 80's (both inclusive), paper 11 in. by 11 in.
Sizes 88's to 110's (both inclusive), paper 10 in. by 10 in.
Sizes 120's to 200's (both inclusive), paper 9 in. by 9 in.
Sizes 210's to 240's (both inclusive), paper 8 in. by 8 in.

In the event of the size of paper used being smaller than that specified above for any respective size of apples, such apples shall be double-wrapped by overlapping two papers.

APPLES APPROVED FOR EXPORT TO EUROPE.

Maximum Size.	Variety.	Minimum Size.	Maximum Size.	Variety.	Minimum Size.
	Solid Red Varieties.				
96	Baldwin	225	96	Tasma	225
96	Hoover	225			
	Partial Red Varieties.				
110	Crofton	225	96	Sharp's Late Red ..	225
96	Delicious	225	110	Shorland Queen ..	225
110	Dougherty ..	240	110	Shepherd's Perfection	225
110	John Sharp ..	225	96	Spitzenberg ..	225
110	Jonathan	240	110	Stark	225
110	King David ..	225	110	Wagner	225
96	Rome Beauty ..	225	110	Worcester Pearmain ..	225
110	Scarlet Nonpareil ..	240	110	Yates	240
110	Scarlet Pearmain ..	225			
	Striped Varieties.				
110	Adams Pearmain ..	225	120	Ribston Pippin ..	225
110	Allington Pippin ..	225	110	Senator	225
120	Cox's Orange ..	240	110	Statesman	225
96	Premier	225	110	Stayman	225
	Yellow or Green Varieties.				
96	Alfriston	225	110	Gravenstein ..	225
96	Ballarat	225	96	London Pippin ..	225
96	Boston Russet ..	225	96	McMahon's White ..	225
110	Brownlee's Russet ..	225	110	Newtown Pippin ..	225
110	Cleopatra	225	96	Parlin's Beauty ..	225
110	Claygate Pearmain ..	225	96	Reinette du Canada ..	225
96	Dunn's	225	110	Sturmer	225
110	Golden Pippin ..	225	96	Washington ..	225
110	Golden Russet ..	225	110	Willie Sharp ..	225
110	Grannie Smith ..	225			

APPLES APPROVED FOR EXPORT TO SOUTH AMERICA.

Maximum Size.	Variety.	Minimum Size.	Maximum Size.	Variety.	Minimum Size.
	Solid Red Varieties.				
80	Baldwin	140	80	Tasma	140
80	Hoover	140			
	Partial Red Varieties.				
96	Crofton	140	80	Scarlet Nonpareil ..	140
80	Delicious	140	96	Shorland Queen ..	140
96	Dougherty ..	140	80	Shepherd's Perfection	140
96	John Sharp ..	140	80	Spitzenberg ..	140
96	King David ..	140	96	Stark	140
80	Rome Beauty ..	140	80	Wagner	140
80	Salome	140	96	Yates	140
96	Jonathan	140			
	Striped Varieties.				
96	Adams Pearmain ..	140	96	Statesman	140
80	Premier ..	140	80	Stayman	140
80	Senator	140			

APPLES APPROVED FOR EXPORT TO SOUTH AMERICA—*continued.*

Maximum Size.	Variety.	Minimum Size.	Maximum Size.	Variety.	Minimum Size.
	Yellow or Green Varieties.				
96	Cleopatra	140	80	Newtown Pippin ..	140
80	Dunn's	140	80	Parlin's Beauty ..	140
80	London Pippin ..	140	96	Sturmer	140
80	McMahon's White ..	140			

SPECIAL CONDITIONS APPLYING TO EXPORT TO SOUTH AMERICA.

The modifications regarding colour standards allowed for European markets will not apply to apples for the South American markets.

Grades: No fruit below the standard of "Fancy" grade as defined in the Export Regulations to be exported to South America.

Cases: Specifications of standard export case to be strictly observed.

Packing: Corrugated strawboard to be used on top and bottom of cases. Wood-wool not to be used. The use of printed wrapping-paper is strongly recommended. All large fruit to be double-wrapped unless paper of sufficient size is used.

FORTHCOMING AGRICULTURAL SHOWS.

Woodville A. and P. Association: Woodville, 23rd and 24th January.
Helensville A. and P. Association: Helensville, 29th January.
Pahiatua A. and P. Association: Pahiatua, 9th February.
Te Puke A. and P. Association: Te Puke, 9th February.
Buller A. and P. Association: Westport, 9th and 10th February.
Northern Wairoa A. and P. Association: Mititai, 9th and 10th February.
Clevedon A. and P. Association: Clevedon, 10th February.
Rodney Agricultural Society: Warkworth, 10th February.
Dannevirke A. and P. Association: Dannevirke, 14th and 15th February.
Waimarino A., P., H., and I. Association: Raetihi, 15th February.
Wellsford A. and P. Society: Wellsford, 16th February.
Masterton A. and P. Association: Masterton, 20th and 21st February.
Te Awamutu A. and P. Association: Te Awamutu, 21st February.
Omaha and Pakiri A. and H. Association: Leigh, 21st February.
Rangitikei A. and P. Association: Taihape, 22nd February.
Opotiki A. and P. Association: Opotiki, 23rd February.
Franklin A. and P. Society: Pukekohe, 23rd and 24th February.
Rotorua A. and P. Association: Rotorua, 28th February.
Katikati A. and P. Society: Katikati, 1st March.
North Kaipara Agricultural Association: Paparoa, 1st March.
Taranaki Metropolitan Agricultural Society: New Plymouth, 7th and 8th March.
Waikato Central Agricultural Association: Cambridge, 7th and 8th March.
Morrinsville A., P., and H. Society: Morrinsville, 14th March.
Methven A. and P. Association: Methven, 15th March.
Hawke's Bay A. and P. Society: 20th and 21st March (Autumn Show).
Temuka and Geraldine A. and P. Association: Temuka, 22nd March.
Matamata A. and P. Association: Matamata, 22nd March.
Mayfield A. and P. Association: Mayfield, 24th March.

Importation and Quarantine of Dogs.—The prohibition of the importation of dogs into New Zealand from Great Britain, imposed in 1919 owing to severe outbreaks of rabies there, has been revoked as from 8th January. An amendment to the regulations under the Stock Act was gazetted on 8th January, making the period of quarantine on dogs from the United Kingdom a clear six months. Previously the period of six months included the time from embarkation of the animal in Britain.